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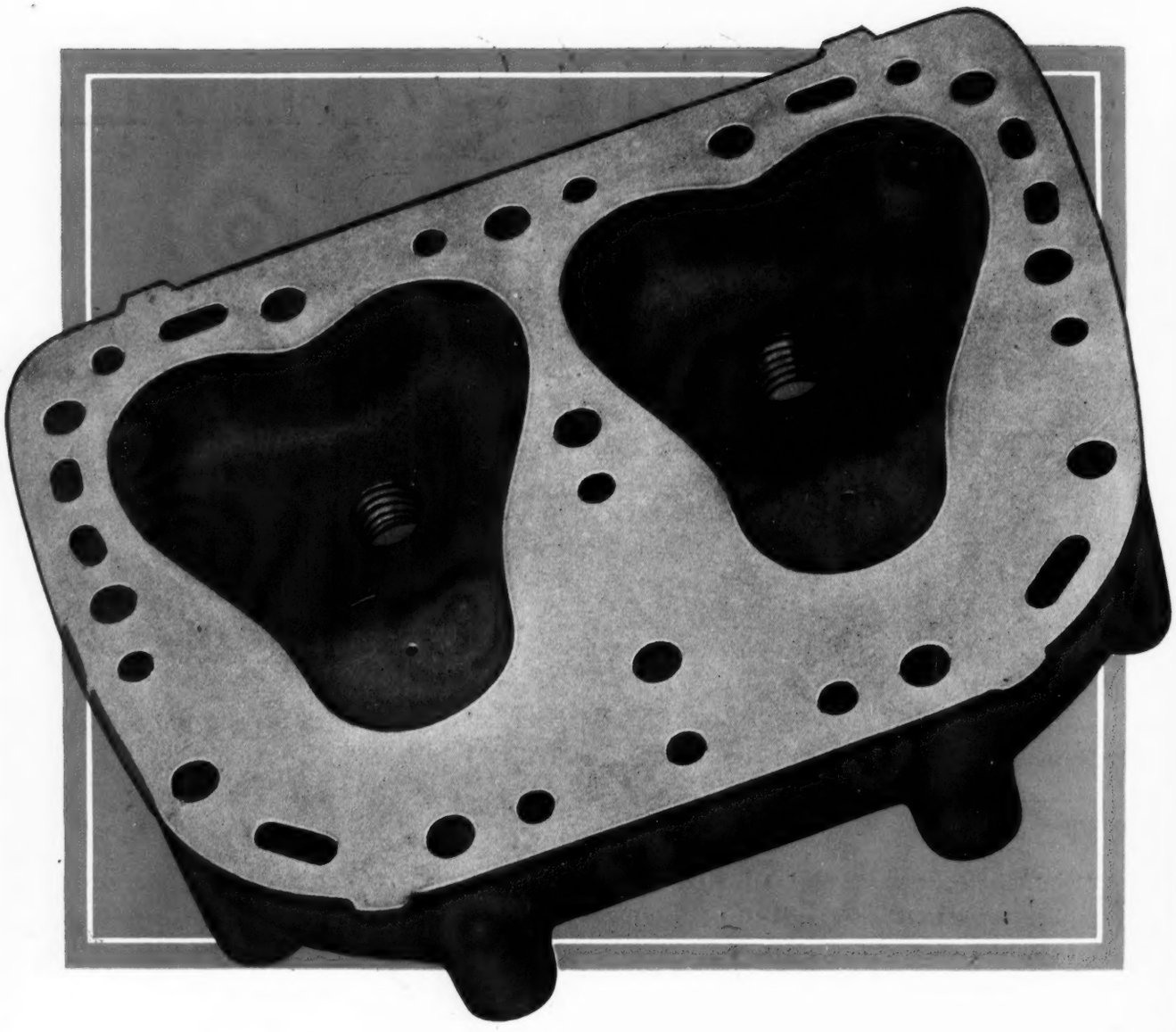

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AUTOMOTIVE INDUSTRIES

VOL. 52 NEW YORK—THURSDAY, MARCH 19, 1925 No. 12

Capital Turnover and Profits

Earnings can be increased by more efficient use of the working capital

By C. A. Musselman

UNTIL quite recently the subject of capital turnover was not given much attention by the average manufacturer in the motor car business. It, however, has such a direct bearing on net profits that now—in a keenly competitive period—it is recognized as one of the factors that contributes largely to success.

Very few makers of cars or important units of an automobile realize fully the advantages and disadvantages of the two types of production based on capital turnover, viz.: a—That where the manufacturer produces nearly all the parts and materials in his own plant; and b—That where the manufacturer purchases most of these supplies and assemblies.

The large maker who controls directly his supplies, parts and even in some cases his materials, can make a substantial portion of his profits from the economies effected by such control even with a limited turnover of inventory. On the other hand, a small manufacturer cannot procure supplies as advantageously as his largest competitor, so he offsets this handicap by internal efficiency, resulting in a more rapid turnover of working capital.

For example—One of the largest makers of six-cylinder cars in 1923 showed a profit equal to 12 per cent of gross sales. The working capital of this maker was turned over four times during the year, which proved that a large portion of the profits could be traced directly to advantages resulting from large scale production and favorable purchasing.

DURING the same period a maker producing about one-twelfth as many cars obtained a net profit of 9 per cent and turned the working capital over six and a half times. A comparison of the production figures of these two concerns is twelve to one in favor of the company producing a substantial proportion of its parts; while the ratio of profits of 12 per cent to 9 per cent indicates that most of these advantages were offset by the ability of the smaller company to turn over its capital more often during the year.

You will note that the relation of profits to turnover of these two companies is: Profits, 12 to 9; turn-over 4 to 6½. Had not the small company been able to turn its capital 2½ times oftener than the large company in a year, the profits would not have been relatively as favorable. This proves conclusively that small companies that are not burdened with the intricate details of manufacture of many different parts and mass production can devote their energies to the study of

THIS article by C. A. Musselman is the 14th in the series which we are devoting to "Profits vs. Volume."

Mr. Musselman deals with a very important phase of the profit problem—capital turnover.

Capital, in its capacity to produce profits, is like a man performing piecework; the faster it works the more it earns.

The manufacturer's problem is to find a way to make it work faster.

THE problem of capital turnover is one which is constantly becoming more important to the automobile manufacturer. Success in the future will be largely determined by the ability to expand or contract production without tying up too large a portion of the available working capital for a long period.

scientific management, and by utilizing the facilities of the many parts makers turn their stock over sufficiently often during the year to make their capital turn-over more frequent than is the case with many large manufacturing enterprises.

It is quite evident that the larger companies which are manufacturing their own parts are making present profits (small as they are) from economies in manufacturing on a large scale. In many instances the annual rate of capital turnover is as low as three times a year. If this condition is as evident in the future as in the past, it will explain why the small manufacturer with the frequent turnover of capital can compete with the larger company manufacturing many of its own parts.

It is to be regretted that the rapid growth of the automobile industry which developed a number of concerns capable of mass production on an enormous scale caused these makers to figure a very small profit per unit on a very large output, because on such a basis it is necessary for the maker to place orders in advance for materials which would not be used for a considerable period of time and tool up for a definite number of cars. These two elements work against rapid turnover and incidentally prevent the calculated profit per car if production falls below the estimated annual output.

CAPITAL, applied to the manufacture of goods, earns a profit for the one who employs it after certain definite processes have been completed.

The capital is invested in materials, labor, etc. These are combined to fabricate the finished product.

The product is then sold and the profit is what remains over and above the capital required to make and market it.

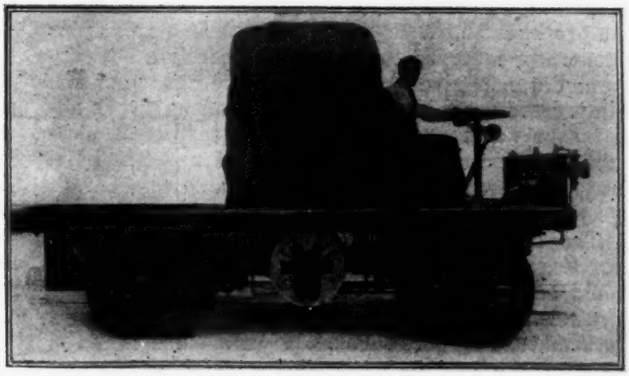
Obviously, the total net profit realized from the original capital during any given period will depend upon the number of complete manufacturing-marketing cycles that can be completed.

The small manufacturer who has nether of these two elements to contend with—the purchase of raw materials or the tooling-up for mass production—can control his purchases approximately every sixty days. In view of this condition is it not advisable for all makers—large or small—to study not only factory costs, but also other production costs, which are affected very directly by capital turnover?

Success in the future will be largely determined by the ability of the manufacturer to expand or contract his production without tying up the maximum capital for a long period. It is well to realize that the profits of the future must be obtained from productions which fluctuate and that the margin per car, to be satisfactory, must be based on the minimum production, and at all times a more moderate working capital be employed which is turned over oftener during the year.

While capital turnover is not the only element that contributes to profits, it nevertheless is an important part of the many things that go to make up profits and is probably the one least understood and considered by the average manufacturer.

As previously pointed out, it is especially important to the small manufacturer who must depend on his internal efficiency to keep him in the game.



A gas-electric truck built in 1903 by the Oil Well Supply Co., of Pittsburgh, Pa., and used by that concern principally for switching freight cars about the plant. It was constructed under the patents of John H. Munson

A Technical History of Gas-Electric Drives

Development of this method of motor vehicle propulsion dates back many years. Chief advantage is smooth, steady acceleration. Various systems are described.

By P. M. Heldt

DEVELOPMENT work on gasoline-electric systems of motor vehicle propulsion by both of the large electric corporations, and the recent placing of an order by one of the large operating companies for 200 buses propelled by such a system, naturally focus attention on this subject.

The combination of the gasoline and electric power systems or the use of electric transmission from a gasoline engine to the driving axle of a car is nothing new, attempts to introduce such systems having been made from the very beginning of the industry. The movement probably was pioneered by Patton, who built an experimental railway line in a suburb of Chicago about the time of the Chicago World's Fair, on which self-contained motor cars deriving their power from gasoline engines were used.

Electric and gasoline power can be combined in a chassis in several different ways. In the early systems the object generally was to secure the advantage of having the combined torque of the two motors available for emergencies. Many of the early cars were equipped with gasoline engines of 5 and 6 hp. rating and were very shy on power, a defect that often became painfully evident on hills and sandy stretches of road. There was at that time much complaint of the lack of flexibility of the gasoline engine, and unfavorable comparisons were made with the steam engine and the electric motor. Both of these latter motors are capable of developing a stalling torque several times their normal operating torque, while the gasoline engine, has no stalling torque at all. Combining a dynamotor connected to a storage battery with the gasoline engine would not only make the latter non-stallable but give it considerable flexibility.

Accordingly a good many designs were brought out in which an electric generator of the shunt-wound type was coupled directly to the gasoline engine, and a storage battery connected across the terminals of the generator. At a certain critical speed the voltage of the generator balances that of the battery and there is then no flow of current. If the engine were dragged down below this speed by the resistance of the motion of the car, the generator became a motor, drawing current from the battery and assisting the engine. On the other hand, whenever there was comparatively little resistance to the motion of the vehicle, as on smooth level road, the engine would run beyond the critical speed of the generator and the latter would then send a charging current into the battery. When the driving connection with the rear axle was broken the engine would drive the generator alone and thus charge the battery at a rapid rate.

Probably the greatest drawback to this system was its great weight. Although the rotor or armature of the generator took the place of the flywheel, the field frame and housing represented considerable weight and the battery weighed about as much as all of the rest of the powerplant together. Naturally, as larger and larger engines were fitted to passenger cars and change gears were improved, this system lost most of its advantages and little was heard of it after 1905.

Features of the Entz Type

A second general type is represented by the Entz, which for many years was used in the Owen Magnetic car. In this case the field frame of a generator was fixed to the crankshaft of the engine and served as a flywheel. The armature of this generator was connected through a propeller shaft to the rear axle. For high speed the armature winding was short circuited upon itself and the generator then acted as a flexible clutch, transmitting the power of the engine to the rear axle without there being any positive mechanical connection between engine and axle. There was always a certain amount of slip of the armature relative to the field frame, and this caused a current to be induced in the armature windings, the re-

action of which current with the magnetism of the generator field was the cause of the torque that was impressed upon the propeller shaft.

The generator referred to constituted merely a slipping clutch and did not give out any more torque than the engine impressed upon it. For starting and hill work additional torque was required, and to provide this an electric motor was placed upon the propeller shaft behind the generator. The armature of this motor had two separate windings which could be connected either in parallel or in series. The current generated in the armature of the generator was sent through the armature of the motor.

It should be pointed out that the torque of an electric motor depends upon the magnetic strength of its field and upon its armature ampere-turns. If we assume that the magnetic strength of the motor is the same as that of the generator, then if the current generated in the generator armature is divided between the two windings of the motor by connecting them in parallel, the motor will generate the same torque as is transmitted by the generator, and as the two torques add together, the engine torque is doubled before it is further multiplied by the rear axle gears. The engine torque can even be trebled by sending the armature current from the generator through the two armature windings of the motor in series. Other variations in torque could be obtained by varying the field strengths of the generator and motor, and altogether five changes in torque and speed were obtained.

Battery Added Later

Originally no battery was furnished with this system, but later it was provided with a battery and was made self-starting and non-stalling. Reversing the motion involved some difficulties with this system. The generator armature was disconnected from the propeller shaft by a clutch and held stationary, and the field winding of the motor was reversed. The advantages of this system were that all control of speed was by a controller lever on the steering wheel and that there was no positive mechanical connection between the engine and the chassis, hence the engine was protected against the effects of road shock. The disadvantage was that the electrical machinery was quite heavy. Possibly the fact that the average garage mechanic was not familiar with the electrical portion of the power plant also had something to do with its disappearance from the market.

A later system and the first actually used on motor buses, is the Tilling Stevens, which was brought out in England about a decade ago. This is merely an electric transmission system, all of the power of the gasoline engine being at all times converted into electric power and as such transmitted to the electric motor which converts it back into mechanical power, but at a different relation between torque and speed. Generator and motor are both arranged co-axially with the engine, the generator being connected to the engine through a flexible coupling. The generator is compound wound and the motor series wound. The series windings of the generator and motor are connected in parallel, one of them having a variable resistance in series with it, so that the current from the generator armature can be divided between them in different proportions. When all of the resistance is cut out the two fields take practically the same current. As resistance is inserted into the circuit of the motor field winding, this field is weakened and the motor consequently runs faster.

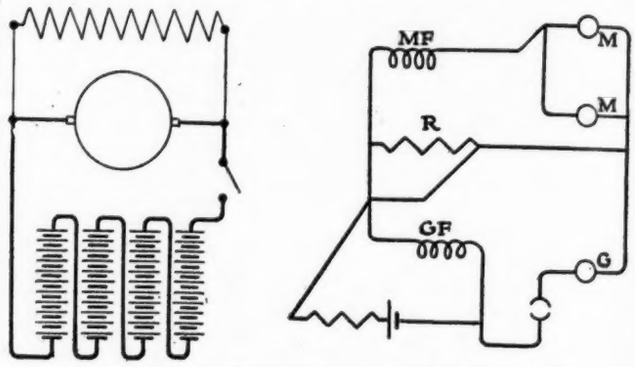


Fig. 2 (left)—Wiring diagram for early type gas-electric system in which the dynamo acted alternately as generator and motor; (right) diagram of connections of Entz electric system, high speed position

It is this general type of powerplant that is meeting with favor for motorbus work and the question naturally arises, What are its advantages for this purpose? It is quite obvious that in normal running at constant speed there cannot be any gain from the standpoint of fuel economy, because all of the power has to be converted first into electrical power and then back into mechanical power, and the losses sustained in this double conversion are practically additional to the losses with a mechanical transmission. The advantages have to do entirely with starting acceleration and deceleration of the bus.

In the first place, the starting operation is a very simple one, consisting in moving a controller lever slowly from the neutral to the full speed position. The operation is exactly the same as that of starting and accelerating an electric automobile, which, as is generally known, requires no particular skill. This undoubtedly is an advantage to the bus operating companies in that it eliminates the necessity for a protracted period of

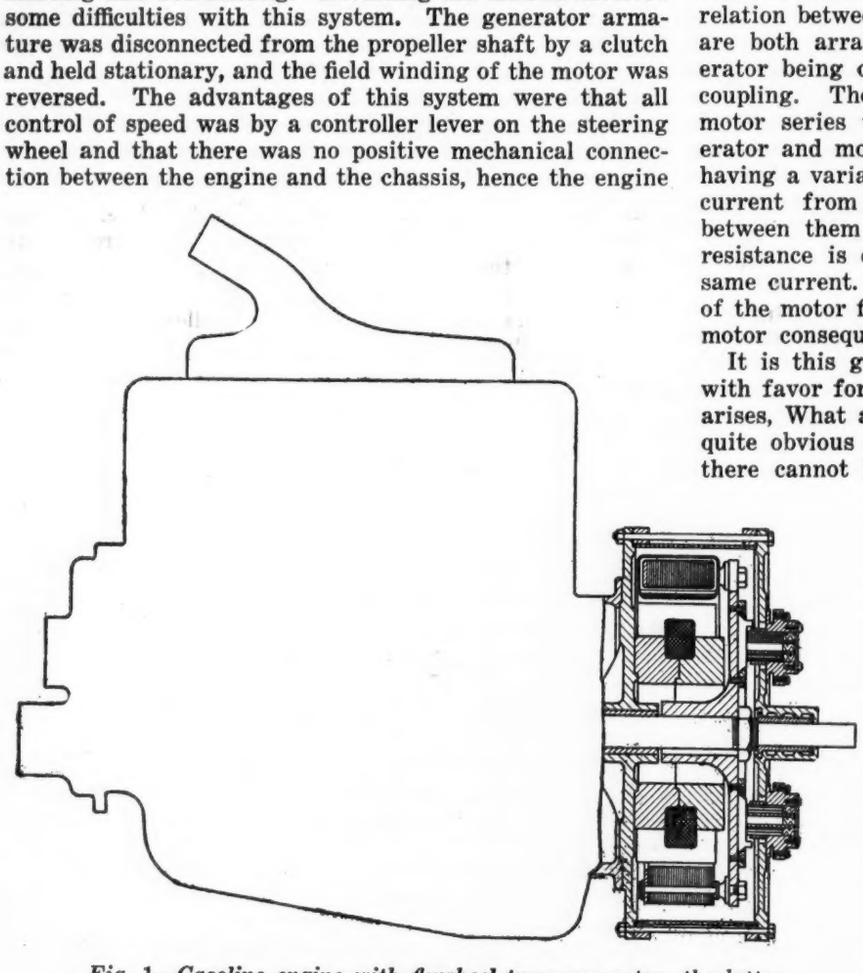


Fig. 1—Gasoline engine with flywheel type generator, the latter shown in section

training of new drivers, and it is possible that a somewhat cheaper grade of labor can be used for the operation of the buses.

In the second place, the mechanism of the bus cannot be injured by unskilled handling, at least not as easily as that of a bus with mechanical drive. The third and probably most important advantage is that acceleration of the bus is both more rapid and smoother than with a mechanical drive. Acceleration from a standstill to the maximum speed is continuous, without interruption, and this eliminates the shocks to the powerplant and the whole transmission line due to engagement of the clutch after shifting gears.

Mechanical Gear Problems

With the ordinary mechanical gears acceleration takes place in a number of stages separated by an interval during which there is a deceleration. On the low gear, which is picked up first, acceleration generally is very rapid, because on this gear only a small proportion of the available engine power is required for moving the bus and there is a large balance left for acceleration. The speed to which the bus can be accelerated on the low gear is, of course, limited, and the driver must then shift to the second gear. During the shifting period no power is applied to the driving wheels and the bus decelerates, as a result of the resistance to its motion.

After the gear has been shifted and the clutch is let in again, the engine runs much faster proportionally than the bus and if the clutch is allowed to engage rapidly the whole system receives a severe shock. If care is taken to let the clutch in gradually this shock can be avoided to a great extent, but probably bus drivers cannot be counted on to exercise any great degree of caution. What adds to the seriousness of the matter is that a bus in service in congested urban districts has to be started and stopped almost continuously, hence the shocks follow one another at short intervals and if the clutch is "fierce" or the driver is careless the wear and tear on the mechanism is very high.

Where an electric system of transmission is used the generator field generally carries both shunt and series windings; in other words, the generator is compound wound. With shunt fields alone the voltage generated will drop slightly with increasing load. A series winding can be put on the field which will exactly overcome this drop and so keep the voltage constant irrespective of the load on the generator. The generator can also be overcompounded, that is, provided with a series field coil having

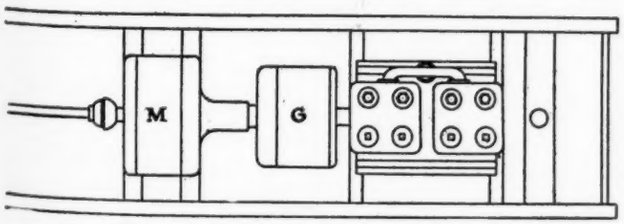


Fig. 3—The Entz system as applied in the Owen magnetic car

more turns than required to keep the voltage constant with increase in load. Or it may be under-compounded, allowing the voltage to drop very slightly with increase in load. On the whole the tendency of a compound wound generator is to keep up its voltage even though the load is greatly increased.

The motors used for such a drive are the regular series wound motors which are almost universally used in traction work, as well as for electric starters. When such a motor is connected across the terminals of a source of constant voltage without any resistance in circuit it forms practically a short circuit and draws an enormous current. This would be too much of a shock to the generator and engine, and, therefore, a resistance is generally connected in the circuit between the generator and motor in order to limit the starting current.

The heavy current drawn by the motor flows through both its field winding and its armature, with the result that in starting the magnetic field is up to its maximum strength and there are also a great many ampere-turns on the armature. These two factors determine the torque developed by the motor, and it will thus be seen that the

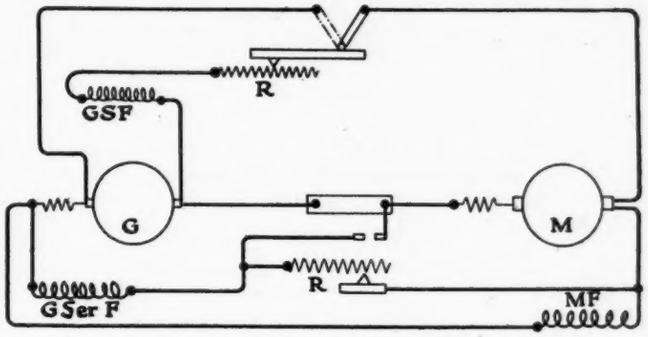


Fig. 4—Diagram of connections of Tilling-Stevens bus

starting torque of a series motor is very large (as compared with the torque which it can deliver continuously). In fact the torque of a series motor varies with its speed somewhat as shown in Fig. 6.

By means of resistances in circuit the torque during acceleration can be controlled as desired. To cut out the resistance it is merely short circuited, and this does not entail cessation of the current flow through the motor, hence there is no interruption of the torque impressed upon the driving wheels.

There is one objection to the use of resistance in keeping down the current flow and the torque in starting, namely, that considerable energy is lost in the resistance, and the efficiency of transmission when current passes through the resistance is therefore low. To overcome this objection, at least in part, a differential compound wound generator is used in the system applied to the Yellow Coach buses ordered for Philadelphia. In a differential compound generator the series coil is connected up the reverse way, so that the current flowing through it decreases the strength of the field instead of increasing it.

Current Flow Reduced

Therefore, when the motor is suddenly connected across the generator terminals in starting and presents the condition of a virtual short circuit, the generator voltage drops far below its normal value and not so much current will flow. Of course, the current flowing through the series field coil under these conditions may be regarded as a loss, because it simply neutralizes an effect produced by the shunt or separate exciting coil, but this loss is small as compared with that in a resistance in the main circuit to regulate the current flow.

In a series motor, owing to the fact that both the field strength and armature ampere-turns increase with the current, four times the full load torque can be obtained with from two to three times the full load current. Hence, if the voltage of the generator drops to between one-third and one-half when delivering this current, the generator output need not increase beyond its normal maximum, which, of course, it cannot do if that corresponds to the full output of the engine.

Thus a torque multiplication of four to one could be

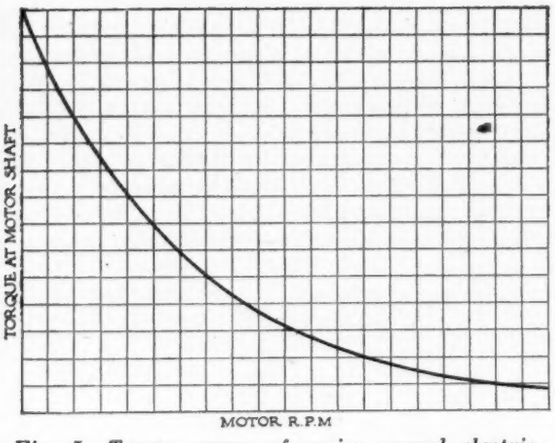


Fig. 5—Torque curve of series wound electric motor

obtained with this electric transmission, which is about the same as that normally obtained with a mechanical transmission. Of course, the heating effect in both the generator and motor would be high while a current of this magnitude was flowing, but in bus work this would be required only for short periods while starting and accelerating and the extra heat generated in the armature and field coils during these periods could readily be dissipated during periods of normal operation in between.

The characteristics of such a bus are quite similar to those of a storage battery bus, with the one exception that the gasoline engine generating plant is considerably lighter than a storage battery that could furnish the same output continuously, and, of course, the gas-electric bus is entirely self-contained and therefore independent of power houses.

Any vehicle that is frequently accelerated must also be frequently decelerated, and in this connection the electric transmission system is also a convenience. By short-circuiting the electric motor or motors through a suitable resistance, the stored energy of the car is converted into electric energy and dissipated in heat. This conversion and dissipation takes place without any parts being subjected to great mechanical strain or rapid wear. The electric braking effect is very uniform and requires but very little physical effort to secure it, hence the electric motor forms an almost ideal brake. Of course, as the speed of the car decreases the braking effect decreases and such a brake cannot be used for bringing the bus to a stop or for holding it on a grade, but it is very effective for retarding it.

Durant Dealers Offering Owners New Maintenance Plan

GETTING owners to bring their cars into the service station regularly for necessary maintenance work for which a flat rate charge is made, is the objective of a plan which has been developed by Durant Motors, Inc., for the use of its dealer organization. By taking advantage of this plan an owner keeps his car in good operating condition and avoids expensive repairs resulting from neglect. From the dealer's standpoint, the plan assists him in keeping his customers satisfied, creates business for his service department, and keeps him in close contact with his owners.

The plan provides a definite schedule of maintenance operations to be performed on cars at 500 mile intervals. These operations cover lubrication, tightening and adjusting service only, for which the dealer makes flat rate charges ranging from $2.20 to $6.50.

Owners Must Cooperate

Obviously the success of any plan of this character depends on the cooperation obtained from owners in carrying it out. Several features have been incorporated in the plan to assist dealers in selling it. First, a small booklet has been got out in which the importance of regular maintenance is emphasized. It also explains the details of the plan for providing this service and lists the work to be done on the car at the end of each 500 miles of service together with the flat rate charge made in each case. In the foreword of the booklet considerable stress is laid on the fact that the satisfaction an owner gets from his car is entirely in his own hands as it is up to him to see that it is maintained in proper operating condition, and that by cooperating in carrying out the plan he will get a better grade of transportation service at a lower cost than he otherwise would. This booklet is given to the owner when he accepts delivery of his new car, at which time the dealer explains the plan in detail.

Another factor in securing owner cooperation is a small sticker which is pasted on the glass face of the speedometer to remind him when it is time to bring his car into the service station for maintenance. These stickers are mounted directly above the last three figures on the total mileage odometer. When the last three figures on the odometer correspond with the figures on the sticker, the car should be driven into the service station for maintenance.

The pasters are supplied by the factory in booklet form. Series of numbers ranging from 000 to 900 in steps of 100 are provided.

Assume that the total mileage shown by the speedometer on a car which has been driven in for maintenance is 1092. Before the car leaves the shop, the old sticker is washed off and replaced with a 600 sticker torn from the booklet. This reminds the owner that when his total mileage reaches 1600, he should bring his car in.

Follow-up Card Used

A follow-up card has been devised as an assistance to dealers in seeing that owners report regularly for maintenance service. The date each operation is performed is entered in the proper space on the card. It is then filed in a date tickler file which will bring it to the dealer's attention at about the time the next maintenance work should be done. If the owner does not bring his car in at that time, he is followed-up either by letter or telephone.

The paper work in connection with the operation of the plan is simplified by having tags on which complete shop instructions are printed. When a job comes in, it is simply necessary to fill in the owner's name, license number and repair order number. The tag then is hung on the car and gives the shop all the information it needs. The repair order may be filled out in the regular way but, instead of detailing the work to be done, it is simply necessary to put down the number of the maintenance operation.

Another card form has been developed and is filled out for each owner to give a complete record of the service history of his car. This information is useful in pointing out possible customers both for the service and car sales departments, and also in appraising the car should it be offered in trade.

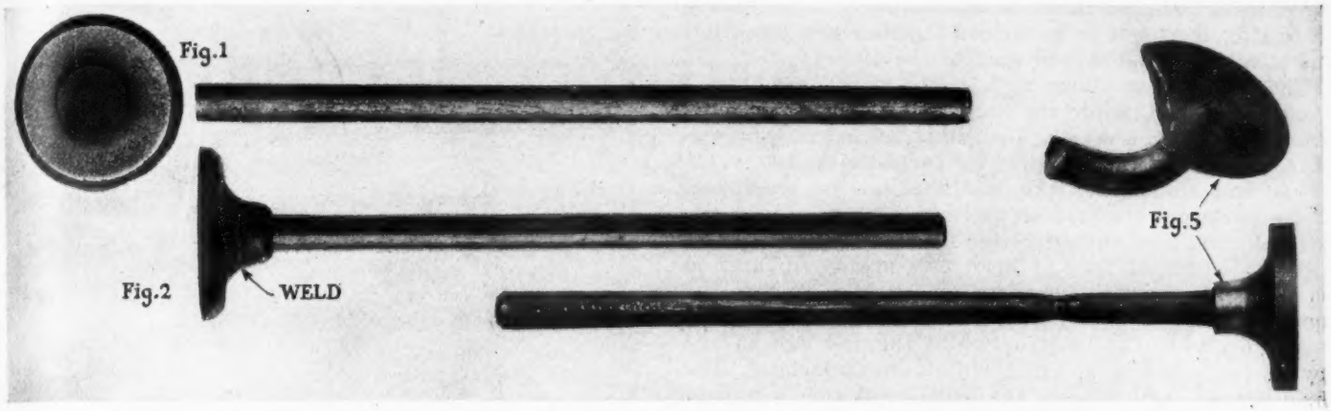


Fig. 1—Cast iron head and steel stem of valve ready for butt welding by Hall process. Fig. 2—Welded valve as it appears after removal from welding machine. Note absence of burr at weld. Fig. 5—Valve welded by Hall process after "pulling" in Olsen testing machine until stem is necked and just ready to break. Above is valve welded in same way and then placed in vise and hammered over 90 deg. The head has been broken by hammering, but in neither case is there evidence of failure at the weld

Cast Iron Valve Heads Can Be Welded to Steel Stems at Rate of 400 per Hour

New process minimizes machining operations. No drilling or threading required. Shank is upset during butt welding so that strength of joint is greater than that of the stem.

By Herbert Chase

WELDING steel to cast iron was considered a practically impossible task only a relatively few years ago, yet today such welds are not only possible on a commercial scale, but can be made at the rate of 400 per hour, according to information furnished by the Taylor-Hall Welding Corp., 3 May Street, Worcester, Mass. P. M. Hall, a member of this firm, which is the New England agent for Thomson welding machines, is responsible for developing the process here described, which involves welding the steel stem of an ordinary poppet valve to a cast iron head.

This process is quite unlike other methods for fastening cast iron valve heads to steel stems, although electric welding machines are employed in processes now in general use. It consists in making a butt weld between two flat surfaces and does this without any initial machining operations on the stem and only the rough grinding of a flat surface on the boss under the head of the valve. Fig. 1 shows the parts before welding and Fig. 2 the same parts after welding.

After welding, the stem of the valve is ground to size and the valve seat is ground, while any other machining operations required on the head, such as slotting, are completed as in normal practice.

Areas Determined by Tests

In order to secure a weld as strong as the stem of the valve, the stem is upset during the welding process. The die used to hold the stem controls the size of the upset and holds the upset portion to the desired form. By this means the area of the welded joint is made about three times that of the section of the stem and the strength of the joint then exceeds that of the stem or the head.

This proportion of areas was arrived at after numerous tests to which valves were subjected in a tensile testing machine. In these tests the valves were seated as in normal service, with the head supported in the fixed head of the machine, while the stem was gripped in the movable head. With the Hall valves the average pull when the stem broke is given as 56,630 lb. per sq. in. When the cast iron broke the average pull was 23,300 lb. per sq. in. In each case, it is claimed, the break occurred either in the head or in the stem and not at the weld.

Special Copper Dies Used

Having determined the area of joint required for satisfactory strength, it remained to find a method of controlling the welding process in such a way that the personal element would be eliminated and a uniformity of weld secured. This involved a proper combination of the pressure, time and current employed. For a valve with ⅜-in. stem diameter, the diameter at the weld is about 11/16 in. and the total pressure used on the area of a circle of this diameter is about 5000 lb. It is stated that 5 kw.-hr. is required for making the weld on 100 valves, and that the weld itself requires but 2 sec.

Special dies, consisting largely of copper, but with steel portions where the upset must be formed, are required, but they are adapted for use on a standard Thomson No. 30 S. P. Butt Welder, such as that shown in an accompanying cut, Fig. 3. This is fitted with air operated clamps for holding and opening the dies and with

a hydraulic cylinder for creating the pressure necessary in forcing the parts to be welded together and upsetting the stem to fill the shaped neck of the die.

The die head or clamp at left end of the machine is fixed to the bed, while the second head is moved horizontally on a slide by the hydraulic cylinder. Any one of several conventional devices for feeding the valve heads and stems into the machine can be employed. These parts are clamped securely in correct relative position by the dies and operation of the machine is automatic in so far as time of weld, pressure on surfaces to be welded and current flow are concerned. All that the operator must do is to operate the controls.

An idea as to the construction of the dies can be had by reference to Fig. 4, which is only diagrammatic. The fixed portion, which holds the valve head and is formed to fit its contour, is shown at the left. It can be made entirely of copper, forming, of course, one of the electrodes of the machine. The other portion, which holds the valve stem, is made in two halves with a joint in the horizontal plane passing through the axis of the stem. The lower of the two halves is fixed to the sliding table of the machine, while the upper half is carried in the die holder mounted on the same table and is lifted by the air operating device when a new piece is to be inserted.

Each of the two halves carries half of a steel collar, the hole in which is flared to form the fillet around the upset portion of the stem. This collar, of course, is fastened rigidly to the copper backing which forms the bulk of the die. It is used for the reason that a die made entirely of copper in contact with steel on a forming surface is more likely to be worn out of shape than the harder steel.

Stem Projects Through Die

The end of the valve stem at which the weld takes place projects far enough through the die to give the amount of metal required to form the fillet and upset portion of stem. As this end becomes heated after the current is turned on it deforms under the high pressure applied until it fills the bell shaped mouth of the die. The other end of the stem rests against a stop which positions the stem and prevents it from being forced backward as the die advances.

It is worthy of note that the finished valve has a stem which is an integral part of the head, a fact which facilitates transfer of heat from head to stem and thence to the valve guide and water jacket. For this reason it is believed that the valve will run cooler than one having a head not in good thermal contact with the stem.

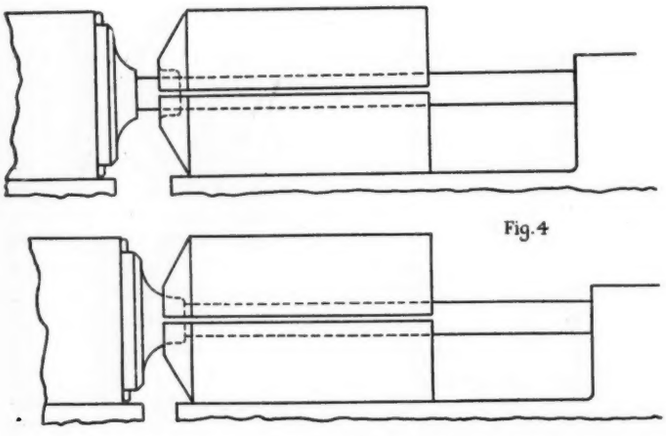


Fig. 4

Fig. 4—Diagram of dies used to hold valve head and stem during welding process

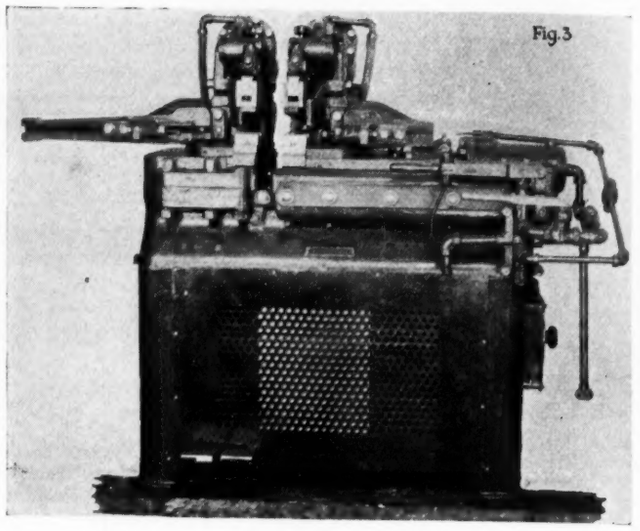


Fig. 3

Fig. 3—Model 30 S. F. Thomson Butt Welder with air clamps and hydraulic cylinder. This machine is used for welding valve heads to stems, but the dies shown in position are not those employed for this purpose

Tests made by Mr. Hall on a special machine with a cam designed to permit the valve to drop suddenly ¼ in. to its seat under influence of a Ford valve spring fitted in the same manner as in normal service, are claimed to have shown that the life of the Hall valve is several times as long as that of other valves in which the head is drilled, or drilled and tapped, the stem forced or screwed in and thereafter headed over. With the latter form the head is reported to have come loose from the stem in all tests conducted, whereas with the Hall valve it is claimed that when breakage occurs it is invariably in the stem or in the head and not at the weld. A flame, intended to simulate the action of exhaust gas, was applied to the heads of the valves tested in this manner, so that they ran at a dull red heat.

A good grade of cold-rolled screw stock, such as S. A. E. No. 1020 carbon steel, has been used for stems, but other material can be used if desired. These stems can be sheared off to length, providing a clean, square shear is secured, no machine work being required except for grinding after welding and annealing. Any desired grade of cast iron suitable for the service in question can be employed, but it should be of a uniform character to secure best results.

Comparison of Operations

A comparative schedule of operations on the conventional form of valve with cast iron head and one made by the Hall process, both as given by the Taylor-Hall Welding Corp, is as follows:

Conventional Type	Hall Type
1—Drill head.	1—Grind boss on underside of head.
2—Recess top of head.	2—Weld head to stem (2 sec.)
3—Thread or neck stem.	3—Anneal.
4—Force stem into head.	
5—Upset top of stem (6 to 8 sec.)	
6—Anneal.	

Machining operations on either type after head is attached are said to be substantially identical.

Several well known car manufacturers are reported to have tested valves made by the Hall process with excellent results.

Just Among Ourselves

How About Half-Million Vehicle Exports in 1925?

AMERICAN car and truck exporters certainly did a good job last year. The total number of American designed cars sold in foreign countries in 1924 totalled 15 per cent more than in 1923. If 1925 brings forth a similar increase in overseas business, the total this year will be very close to 435,000 vehicles. Since more intensive efforts to get this business are being put forth every year, however, there would seem to be a good chance for the 1925 total to come within shooting distance of the half-million mark. Such an estimate is optimistic, of course, but it makes a good goal to strive for.

Denies Being a Three-Toed Sloth

OUR attention has just been called to the fact that the famous three-toed sloth of crossword puzzle fame has a name corresponding with the initials of AUTOMOTIVE INDUSTRIES. J. A. C. Warner of the S. A. E. is responsible for the allusion. All we can say is that if Mr. Warner had seen this place in action just before the Statistical Issue come out he wouldn't have gotten any impression of slothfulness. As to the three-toed part, we really don't care to go too far into these personal matters.

Constant Improvement and No Yearly Models

THE "constant improvement and no yearly models" idea continues to gain headway as time goes on. Packard is the latest addition to the growing list of companies which have adopted this policy. So far as can be determined, every factory that has tried the plan has found it to be beneficial both to itself and to its dealers. Certainly there is much to be said in favor of any system which makes it possible for a man to buy a car without fear of having it obsolete, particularly in appearance, before he has driven it around the block. That doesn't mean that body design changes never should be made—far from it. It does mean, however, that frequent and radical changes may do more harm than good from a merchandising standpoint.

Arabian Nights Tales Come True

SOMETIMES we think that engineers must lose a lot of joy in life just because of their detailed knowledge of facts and their ability to explain materially almost everything that happens. Take the world's record flight in an ordinary airplane with engine stopped which was made near Marseilles by Sergeant Wernert the other day. Wernert soared for nine hours and seventeen minutes. Think of going up in the air and floating around for a whole day. Why, the magic carpet of the Arabian Nights isn't a bit more thrilling than that. Somebody started to explain to us just now how there isn't anything unusual about the performance, after all; that it simply involves proper use of certain air currents and what not; but we wouldn't listen. It is much more fun to think that Arabian Nights stories have come true—we always believed them, anyhow.

Replacement Business Gives Steady Trade

IT'S been said many times that so long as there are more than 17,000,000 motor vehicles in operation a good market for many kinds of automotive products will exist every year regardless of general business conditions. The gasoline consumption figures for 1924 illustrate this point very well. Last year wasn't any great shakes so far as the industry as a whole was concerned, nor for the car builders themselves. Just the same 1,095,589,805 more gallons of gasoline were consumed by the United States than in 1923. Increased gasoline consumption means increased motor vehicle use. When more vehicles are operated more miles, replacement business in parts and accessories is bound to increase. The car manufacturer benefits from this steady replacement business in two ways: he sells replacement parts and his dealer organization is kept stable in times of low car sales by reason of a steady trade in equipment items. It's a wind that blows everybody good.

"A Line of Bunk and a Line of Fact"

"A LINE of bunk, then a line of fact. That's the way to write advertising. If you stick to that rule you'll always have a good ad." Such was the advice imparted some years ago by a famous circus publicity man to a cub reporter who was to write some advertising about the show. "For instance," he went on:

"'Greatest Show on Earth'" ("That's bunk").

"'Barnings Three-Ring Circus'" ("That's a fact").

"And so forth." Well, circus advertisements aren't the only ones that have been written on that basis. The philosophy of the old-time press agent doesn't fit in with modern advertising needs, but it has been utilized in more than one automotive campaign. It's a pleasure to record, however, that things seem to be getting better every day.

N. G. S.

Opposition to Compulsory Insurance Growing Apace

Public opinion has swung from approval to disapproval in last three months. Evils far outweigh benefits, insurance executive says. Does not prevent accidents.

By Henry Swift Ives
Vice-President, Casualty Information Clearing House

THE author of this article, Mr. Ives, estimates that compulsory liability insurance would impose an additional financial burden of at least $550,000,000 a year on the owners of motor vehicles in the United States.

This amount is equal to the entire tax now levied on the industry.

Mr. Ives is an insurance man and his views are presented as a summing up of the case of compulsory insurance from that standpoint.

THE efficacy of facts in changing public opinion has never been more strikingly illustrated than in the near collapse during the last month of the campaign to compel all motorists to provide themselves with liability insurance.

When the 1925 legislative sessions swung into action early in January it was quite generally believed that many states would enact so-called compulsory liability insurance laws. Bills of this character were introduced in the legislatures of some thirty states, and they seemed to be backed by a well defined favorable public opinion. In the short space of two months, however, the bills which have come to a vote have been rejected and in the states where such measures still are pending interest in pushing them rapidly is waning.

It is very likely, in fact, that the 1925 legislative sessions will pass into history without any compulsory insurance enactments despite the great ado which has been made over this subject during the last two or three years.

The proposal that the State compel each automobile owner to provide some sort of a guarantee, within certain legislatively determined limitations, of his ability to meet all legally established claims against him resulting from the operation of his car is in reality only a by-product of the constantly growing demand that something be done to reduce materially the enormous human toll exacted by the automobile. It is, however, only a synthetic by-product. It seeks to reach the cause of the accident problem by first mitigating its effect, instead of adapting to the situation the logical, direct method of reaching the effect by first mitigating the cause.

This the proponents of compulsory insurance did not fully appreciate. They did not realize that highway accident prevention, which is the main objective of the public demand for relief, had little or nothing in common with their scheme. Indeed, they classified both under the same heading.

The first awakening came when the Conference on Street and Highway Safety held in Washington last December under the auspices of Secretary Hoover refused to indorse compulsory insurance as a part of its program. And it even was the sense of many in this Conference, although not expressed by resolutions, that such insurance would add to the difficulties of the proposed safety campaign and, in fact, would tend to increase accidents. This attitude on the part of the leading safety engineers of the country was a blow to the compulsory insurance cause because it shattered the halo of altruism which had surrounded that movement — the very thing which made it most formidable.

And it became quit obvious to those who gave the matter any thought that it is more humane to prevent accidents than to stimulate them by a law which permits highway carnage to go on provided the heirs of the dead are cared for and the maimed and injured indemnified.

It is generally recognized that the adoption of any of the compulsory liability insurance proposals undoubtedly would lead to a considerable increase in the highway accident record. Under present conditions there is a vast army of uninsured drivers who have at least a limited financial responsibility and many of these naturally are restrained from reckless and careless operation of their cars for fear of jeopardizing their property. But if a compulsory insurance law were adopted it is reasonable to suppose that this restraint would be relaxed and the feeling would be general among members of this class that they would have little or nothing to lose in a financial way in case of accidents for which they might be held responsible at law.

Standing alone and divorced, as it should have been long ago, from the accident prevention campaign, compulsory insurance, however, still had an appeal. It seemed indeed to coincide with the community's felt sense of abstract justice, and that alone made it difficult to oppose.

The argument of its proponents was simplicity itself. They pointed out the human toll taken by the automobile, the tremendous economic loss due to the lack of financial responsibility on the part of *some* of the drivers at fault, and drew the conclusion, illogical but seductive, that every automobile driver should be compelled to provide some sort of security that he could meet all legal obligations on account of accidents as a pre-requisite to obtaining a license to operate upon the public highways.

This argument, however, seldom was carried any further. No analysis was made of the probable effect, of the cost, of the real necessity, or of any of the other important factors entering into any sound discussion of legislation of this or any other kind. It was, indeed, one of those

occasions which so often arise in a democracy where an evil is seen and the cry immediately goes up "there ought to be a law about it."

The analysis which the proponents of compulsory insurance failed to make was made, however, by others. When the people generally and legislative committees and assemblies in particular were confronted with facts in place of speculations there resulted a change in opinion as to the efficacy of the scheme.

Disadvantages Are Shown

As already related, the failure of the Hoover Conference to indorse compulsory insurance raised the first doubt, and this doubt was raised to the level of conviction by the publication of the reports of the Motor Vehicle Conference Committee, the American Automobile Association and the Casualty Insurance Committee of Nine on "Financial Responsibility for Automobile Accidents."

These reports stressed the following points, among others, as the groundwork for opposition to compulsory insurance:

1. It would increase accidents.
2. It is a legislative patent medicine for a disease that needs a specific.
3. It would burden many for the benefit of few.
4. It would breed more evils than it would remedy.
5. It is not supported by a substantial public demand.
6. It is not required to meet any social or economic crisis.
7. It would inevitably increase the cost of insurance.
8. It would impose, if generally adopted, an additional tax of at least $550,000,000 annually upon the American people.
9. It would be a futile gesture if not generally adopted.
10. It would double the present annual tax on the motor vehicle industry.
11. It would enormously increase litigation.
12. It would impair the institution of insurance by transmuting it from the status of a voluntary association for self-protection into an involuntary association for the protection of others.
13. It would inject into our economic system a new form of political compulsion which might well open the door to many abuses, and promote the use of insurance for subsidies, class gratuities and subventions.
14. It would lead to a demand that the State go into the insurance business on a wholesale scale.

The Case in Brief

Since the declaration of principles adopted by the Committee of Nine states the case against compulsory insurance briefly, adequately and completely, not only from the insurance viewpoint but from the viewpoint of the automobile owner and manufacturer as well, that declaration is summarized as follows:

A. The prime and fundamental need in relation to the operation of motor vehicles is to prevent accidents and all regulatory legislation should be framed with that need in view. Prevention should not be subordinated to indemnity.

The evil is not that certain individuals may not be indemnified for injuries suffered through the faults of others, but is, that because of reckless and negligent operation of motor vehicles upon our highways and the disregard of laws many individuals are injured. If the evil is remedied—that is, if motor vehicle accidents are reduced in number—then the minor result of this evil will be reduced in at least the same proportion and it will be reduced in a way of utmost value; for the saving of life and limb will be substituted for the palliative of assured indemnity. There can be no adequate indemnity for loss of life or for serious injury.

Prevention of accidents, therefore, must be the aim.

B. Compulsory assurance of pecuniary responsibility is at best but a partial and ineffective answer to the question of how to protect the public against the loss caused by pecuniarily irresponsible owners of motor vehicles.

Compulsory motor vehicle insurance has been suggested because individuals in motor vehicle accidents are at times unable to collect damages because of the pecuniary irresponsibility of the motor vehicle operator at fault. Even as a means for assuring indemnity to those who may be injured, or to the dependents of those who may be killed in motor vehicle accidents, it would be ineffective in any of the following cases:

1. Accidents caused by those who insure voluntarily.
2. Accidents caused by operators of adequate pecuniary responsibility.
3. Grade crossing accidents for which railroads are responsible.
4. Accidents in which the owners of cars only are injured.
5. Accidents to occupants of cars where there is no fault.
6. Accidents where fault cannot be proved or where the cars or persons at fault cannot be identified.
7. Accidents in which the individuals killed or injured are at fault.
8. Accidents which occur in private places, parking stations, garages, etc.
9. Accidents caused by motor vehicles when in use without the authority of the owner or when operated by thieves after the car has been stolen.

Would Benefit Only Few

Therefore, compulsory insurance or security will serve only to provide relief in the remaining cases where there is a liability for damages which cannot be enforced because the party liable is pecuniarily irresponsible. Statistics are not available to determine with any degree of accuracy the number of cases of this kind, or the proportion to the total number of fatal and serious injuries resulting from motor vehicle accidents, or the proportion to the number of licensed cars, but, even without exact figures, it is evident that they are relatively few. Should the State in order to safeguard the interests of the few disregard altogether the interests of the many?

C. Compulsion except by way of prevention of accidents should be avoided unless and until it shall be definitely ascertained that the loss through pecuniary irresponsibility, reduced by the most effective accident prevention measures, is grave enough to justify so burdensome a measure.

In every line of human activity there are those who cause loss or injury to others and who on account of pecuniary irresponsibility are unable to furnish indemnity. For the State to select all motor vehicle owners as a special class to be discriminated against because of the faults of a few is manifestly objectionable in principle and may be justified only by the demonstration of absolute necessity in the interests of the public as a whole.

Apart from the inadequacy of such a remedy in the respects hereinbefore indicated, it would be ineffective in the case of motor vehicles traveling to and from different States. Moreover, any such law would directly discriminate against the citizens and business men of the State enacting it. Any measure of this kind would tend to increase the cost of insurance. *Compulsory* insurance of *universal* application would reduce the incentive to careful operation which results from present personal liability and which is now an important factor in holding insurance rates to a reasonable level. Another result which certainly would follow would be an increase in the number of groundless, fraudulent and exaggerated claims for damages, thereby creating still further congestion in our courts.

D. If, however, compulsory security be decided upon by

legislative authority, the widest possible choice of kindly treatment and method should be permitted.

The American system of government is not paternalistic. It does not dictate to citizens who own or operate motor vehicles what they shall do for their own good. The idea of compulsory security is that of protection, not of owners or operators of motor vehicles, but of others who may be injured through their fault. Therefore, any form of security which will fully protect third parties will accomplish the object. Hence it would be unreasonable and obnoxious not to give each motor vehicle owner wide freedom of choice as to the kind of security to be furnished.

Small Percentage Insured

In a recent address, Insurance Commissioner Monk of Massachusetts estimated that only about sixteen per cent of motor vehicle owners are insured. Regardless of its accuracy, this estimate indicates that at least a very large proportion of motor vehicle owners—probably the great mass of farmers and small town people—do not insure. Nor would the deposit of securities with a State official be generally possible or popular. An insurance policy, a surety bond or a deposit of securities should, of course, be allowed; but in addition some other and easier method should be provided that owners of motor vehicles who are unquestionably pecuniarily responsible through ownership of farms or other real estate may comply with the requirements as to security. Unless provision of this kind shall be made, widespread dissatisfaction and unrest will result.

E. Compulsory security by itself will not reduce accidents but will tend to increase the number. Therefore, no such measure should be enacted unless prior thereto or concurrently therewith there be put into effect and enforced in every State laws affecting the operation of motor vehicles in accordance with the recommendations made by the Hoover Conference. In the absence of such concurrent legislation and enforcement compulsory requirement of security will do more harm than good.

Perhaps the most important section of this declaration is that which shows that actually only a comparatively few would be benefited by the tremendous additional tax which it is planned to impose on car owners.

The extent of the burden which compulsory insurance would impose is more easily calculated than is the number of persons who would be benefited. The Committee of Nine in a supplemental statement says that the average cost would be $30 per car for liability insurance only, and for the 15,000,000 cars registered at the end of 1923 this would mean a tax of $450,000,000. Undoubtedly, however, rates would have to be increased because of increasing accidents, fake claims and expensive investigations, and it is quite conservative to estimate the total cost at $550,000,000, which equals the tax bill of the automobile industry today in the United States.

From the standpoint of public policy, however, there is one objection which seems to outrank all others.

Insurance Optional Matter

Insurance today is purchased without the pressure of public authority. The required premiums are voluntary payments made by the buyer with the object of affording protection to his person or property, or both. Under the present conception of the functions of insurance it always is written to protect the person who pays for it, and never for the protection of the public generally. Whatever protection may incidentally accrue to the public through insurance is due to the buyer's foresight in protecting himself or his property and not to any direct contribution made by others.

It is this very absence of compulsion, this absence of static State decree, this absence of the enervating influence of bureaucracy which has permitted the institution of insurance to develop freely and to become a most potent factor in the remarkable social and industrial development of the last century.

To transmute, as it is proposed, the institution of insurance from the status of a voluntary association for self-protection to the status of an involuntary association for the protection of others means ultimately the prostitution of insurance to meet political needs, for the granting of subsidies, class gratuities and subventions and for many other possible similar abuses.

If insurance can be made compulsory and used for the purpose of providing indemnity for certain highway accident victims who may be adjudged entitled to such relief, it may well be made compulsory in a variety of other situations. Motor vehicle accidents are not the only accidents which cause want and suffering. There are thousands of other accident victims in the country who perhaps cannot obtain indemnity but who are at law just as much entitled to indemnity as are automobile victims. *The establishment of the solvency of a judgment debtor in a highway accident case is no more the function of the State than is the establishment of the solvency of a judgment debtor in any other action involving civil liability. And if a single class of tort claims is endowed with superior equities, as is proposed, there sooner or later will be a demand that the same principle be applied to all classes.*

And in addition to this it is not the proper function of the State to compel a certain class of citizens to provide at their own expense guarantees that they can and will pay duly adjudicated claims which may possibly arise as a result of a certain kind of tort which they may possibly commit in the future.

There should be a minimum of compulsion in government. All of us take a variety of chances every day in our goings and our comings. There can be no general guarantee of safety or indemnity for unforeseen and unexpected injuries.

Finally, can it reasonably be expected that compulsory insurance would be enforced with any greater degree to justice or equity than the present highway and traffic laws are enforced? It hardly seems possible. But in any event, compulsory insurance would develop in its wake more evils than it possibly could remedy and that in the last analysis it is a political nostrum which like other similar nostrums is much worse than the disease it is intended to cure.

REFUSING to stop after causing an accident will be punishable, under a new French law now before the Senate, by the withdrawal of the driving license for a period of two to six months if only material damage is done, and by the permanent withdrawal of the license if any person is injured or killed.

This law gives the courts the right to withdraw the automobile driving license for a period varying from three months to a year for a first conviction for manslaughter by negligence, and to withhold the license permanently for a second conviction. In case of injuries only to third parties, the court may order the withdrawal of the driving license for a period of two to six months, and in case of a third conviction the withdrawal of the license is obligatory. For driving an automobile after the withdrawal of the Government license, the penalty is imprisonment for a period of one month to one year and a fine of $30 to $150. The withdrawal of the driving license is in addition to all other penalties provided under the French law.

Sparking Voltage Affected Most by Length of Gap and Compression

Recent investigation bears also on effects of electrode temperature, polarity, electrode material and surface, mixture ratio and turbulence. Important because it determines stress on parts of ignition system.

AN investigation of the sparking voltage of spark gaps has been made for the National Advisory Committee for Aeronautics at the Bureau of Standards and is dealt with in Report No. 202 by F. B. Silsbee.

A knowledge of the voltage of spark plugs is desirable because it affects the electrical strains to which all parts of the electrical system are subjected. Work at the National Physical Laboratory has shown that of two very weak sparks of equal energy content, the one which has the greater sparking voltage is capable of igniting a less inflammable mixture. Certain writers have concluded from this that it is always desirable to have a high sparking voltage, but it seems likely that the increased difficulty of producing any spark at all from such a plug more than offsets the benefit of the increased igniting power when a spark is produced.

In the experiments covered by the present report the ranges of the variables were 0.1 to 6 mm. gap length, one to ten atmospheres gas pressure, up to 700 deg. C. temperature and up to 15,000 volts pressure.

After the primary contact points in the ignition circuit separate, the voltage at the points of the spark plug begins to rise very rapidly, the rate being of the order of 50,000,000 volts per second, but this rise continues for only about a ten-thousandth of a second, until the sparking voltage of the gap (say 5000 volts) has been reached. The gas in the gap then suddenly breaks down; that is, it becomes a relatively good conductor of electricity, and a very large current flows across the gap. The magnitude of this first rush of current is determined by the voltage at which breakdown occurs, by the electrostatic capacity of the secondary wiring and by the very small inductance of the secondary leads. This first discharge probably alternates in direction several times during the next few millions of a second, but rapidly dies down to a much lower value (say 0.05 amp.) which is fixed mainly by the magnetic circuit and the number of turns of the secondary winding. The subject here considered is the voltage at which the gap breaks down, which depends mainly on the dimensions, density of the gas in the gap and only slightly (if at all) on the ignition system supplying the voltage.

The Electron Theory

The best explanation of the process by which the gas changes at a certain definite voltage from an almost perfect insulator into a fairly good conductor of electricity is furnished by the electron theory: There exists in the air a considerable number (several hundred per cubic centimeter) of electrically charged particles called ions. These move under the electric attraction from the electrodes and constitute the carriers of the electric current, by moving to the electrodes and giving up their charges. When the electric force in any region exceeds a certain critical value (about 30,000 volts per centimeter at normal density), these ions may be accelerated to such a speed that on colliding with an electrically neutral gas molecule they split it into a fresh pair of ions, one being charged positively and the other negatively. If the number of new ions thus produced in a given time exceeds the number swept out of the gap and discharged at the electrodes, then the number present will increase indefinitely and in geometric progression, so that an enormous current will flow and be accompanied by the rapid dissipation of energy as heat, light and noise which we call a spark.

The sparking voltage of an engine spark plug may be affected by the following variables:

1. Gap lengths and shape of electrodes.
2. Gas density at the instant of ignition.
3. Electrode temperature.
4. Polarity.
5. Electrode material and surface.
6. Mixture ratio.
7. Turbulence.
8. Rate of application of voltage and original ionization.

Electric Stress on Air

Extensive experimental work has shown that air in bulk (as between parallel plates a considerable distance apart) can withstand a certain definite electric stress (30,000 volts per centimeter at normal density). For other forms of electrode two modifying effects enter, so that the sparking voltage is not strictly proportional to the gap length. The first effect is due to the non-uniform space distribution of the electric force, while the second, which occurs in short gaps, arises from a lack of space in which ionization can occur.

The first effect is exemplified in long gaps between small or pointed electrodes. In such a gap the local intensity of the electric field is much greater near the electrodes and the gas near them will break down when the average voltage gradient over the whole gap is much less than the critical value. A greater stress is then put on the central part, and it, too, may then fail. In extreme cases it is possible for the locally overstrained air to break down without imposing enough additional stress on the remainder of the air to break it down in turn. This condition produces the brush or corona discharge which often occurs at parts of the secondary wiring of ignition systems where sharp points are present. If the electrodes have certain simple shapes (spheres, parallel wires or concentric cylinders), the effect of a non-uniform electric field can be allowed for in the computation of sparking voltage.

The second reason for departure of the sparking voltage from direct proportionality to length of gap—an apparent increase in the specific dielectric strength of air in very short gaps—was first attributed to a condensed layer of air close to the electrodes, but a more probable explanation is that the space available in very short gaps is too short to allow a given ion to produce others by collision, so as to supply the increase in ionization necessary for a

spark. This cramping effect is also produced by curvature of the electrode surfaces and tends to some extent to counterbalance the effects of non-uniformity previously discussed. The net results of these two effects is that the shaping of the spark plug electrodes has relatively little effect on the sparking voltage. This is brought out in Fig. 1, which gives sparking voltages observed at the Bureau of Standards on 25 different spark plugs chosen to cover as wide a range of shape as possible. The solid curve represents data obtained by Paschen on a gap between sphere 0.5 cm. in diameter, and practically all of the spark plugs tested gave sparking voltages within plus or minus 20 per cent of the curve.

Pressure and Temperature

The fact that an increase in pressure hinders and an increase in temperature assists the discharge of electricity has long been known. The voltage increases linearly with an increase in pressure up to 10 atmospheres, but less rapidly at higher pressures. It has been shown definitely that it is the density of the gas which is of importance and that pressure and temperature changes in the gas affect its breakdown voltage only to the extent that they affect the density (up to five times normal density at least). The following simple relation, which is only approximately true, however, is due to Paschen:

$$E\delta = E_1[1 + K(\delta - 1)]$$

where

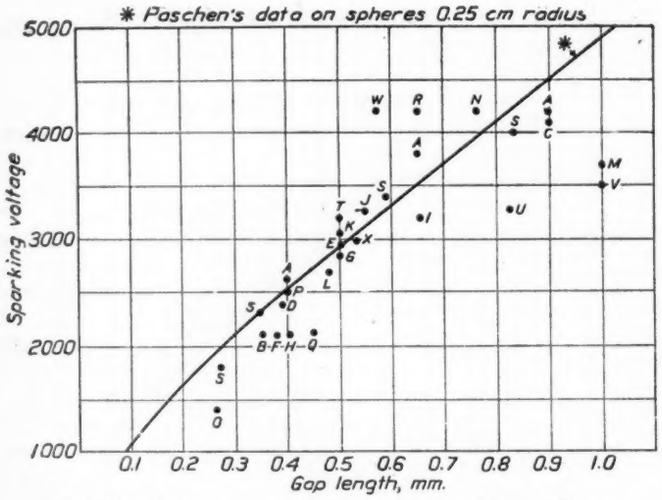
δ = density of air relative to normal temperature and pressure.

E_1 = sparking voltage at density 1.

$E\delta$ = sparking voltage at density δ.

K = a constant which varies from 0.5 to 0.7 for different shapes of electrodes, the larger values corresponding to blunter electrodes.

In an engine the gas density at the instant of firing depends upon the throttle opening, spark advance and compression ratio, and in an aviation engine also upon the altitude. In Fig. 2 are plotted the spark voltages required in a single cylinder Liberty engine throughout a timing range of 160 deg. to both sides of the dead center.



Relation between gap length and sparking voltage

In the experiments the engine was kept running by means of one spark plug, while another plug was connected to a source of high voltage which could be easily controlled and measured and which was applied to the plug for a very short interval at any desired point in the engine cycle. It will be noted that over the range of possible spark settings, from 20 to 40 deg. advance on the camshaft (10 to 20 deg. on the camshaft), the voltage rises by 25 per cent. After the mixture has been ignited but before combustion is complete there are very great variations in density between various parts of the burning mass of gas, and, consequently, the results of the successive measurements beyond dead center are very discordant.

The spark plug electrodes are at a considerably higher temperature than the fresh charge of gas, even after the latter has been mixed with the remnant gases and compressed. By means of a thermal couple the temperature of the central electrode has been found to read 1650 deg. F., but temperatures of from 900 to 1100 deg. F. are more nearly normal for aircraft engines. Recent experiments have shown that the effect of temperature changes of the electrodes is of considerable importance. The measurements were made on a spark gap between a cold brass sphere 1 cm. in diameter and the tip of a thermal couple which would be heated by a small electric furnace. A blast of air playing on the gap insured the maintenance of normal atmospheric density at the gap. When the negative electrode was heated the sparking voltage was reduced by as much as 50 per cent at 1300 deg. F., while when the positive electrode was heated the change was somewhat less, 20 to 30 per cent. The effect is believed to be due to a thin layer of heated gas next to the hot electrode which is not swept away by the air blast nor by the turbulence in the engine. This thin layer becomes overstressed and then affords an effective ionizing region and causes the entire gap to break down.

Tests with Liberty Engine

It is obvious from the above that any change in engine operation which tends to increase the temperature of the spark plug terminals, such as greater throttle opening, higher compression ratio or greater gas leakage through the plug, will tend to decrease the sparking voltage, and vice versa. Tests were made on a considerable number of different designs of plug in a single-cylinder Liberty engine, at part throttle and 25 deg. spark advance, with a rather rich mixture. An approximate estimate of the increase in density due to compression would indicate an increase in voltage in the ratio of 2.47 to 1. The plugs tested were arranged into two groups, the average factor for one group being 1.57 and for the other group, 2.11. The plugs in the former group are of such construction that high temperature would be expected, while those in the latter would be expected to run cooler.

Tests showed that there is a slight increase in sparking voltage if at constant throttle setting the mixture is made either richer or leaner than that corresponding to maximum power. This does not affect that gas density, but the electrodes are cooled considerably by the change in strength of mixture.

In the case of a spark gap with the two electrodes alike in all respects, the sparking voltage will be the same regardless of which terminal is charged positively, but if the two electrodes are different either in shape or in temperature, there will, in general, be a difference in the sparking voltage for the two polarities. The average difference in the sparking voltage of the two polarities as measured at normal pressure and temperature on an assortment of plugs was 14 per cent. In an experimental gap between a cool sphere and a rather pointed electrode heated to 930 deg. F., the voltage with the hot point as anode was as much as 30 per cent higher than with the reverse polarity.

Central Electrode Negative

It is probable that in most spark plugs the central electrode operates at an appreciably higher temperature than the side electrode, and hence, in installing a battery

ignition system, it is desirable to make the central electrode the negative terminal. In the case of a magneto, alternate sparks are of opposite polarity, hence there is no preference in making connections.

Experiments have indicated that when the electrode surface is wet with oil or gasoline, the voltage is increased by from 10 to 20 per cent. If a drop of oil bridges the narrowest part of the gap between the electrodes the spark takes place through the air around the surface of the drop. This requires an increase in voltage varying from 80 to as much as 300 per cent and is believed to explain the observed phenomenon of occasional greatly increased sparking voltages.

Slight Variation Found

While, according to British experiments, the sparking voltage increases in a linear relation with the average molecular weight of the mixture as compared with air, only a very slight variation in voltage with mixture strength in actual engines could be detected at the Bureau of Standards.

Evidence as to the effect of turbulence on the sparking voltage is somewhat contradictory and not at all conclusive.

One effect in connection with the production of sparks that has given rise to considerable controversy is that known as time lag. Assuming that a certain steady voltage when applied to a spark gap is just sufficient to produce a spark across the gap, the spark will not pass the very instant the voltage is applied, but a short time thereafter, and the effect of this is that if the voltage is a rapidly rising one, by the time the spark occurs the voltage has attained a value considerably greater than that which would produce a spark if applied continuously. In ignition systems the voltage in the secondary circuit is near its peak value for only about 0.0001 second, consequently a relatively slight time lag will cause the plug to completely fail to spark. When an auxiliary spark gap is used in series with the spark plug the rise in voltage is even much more rapid.

Irregular Firing

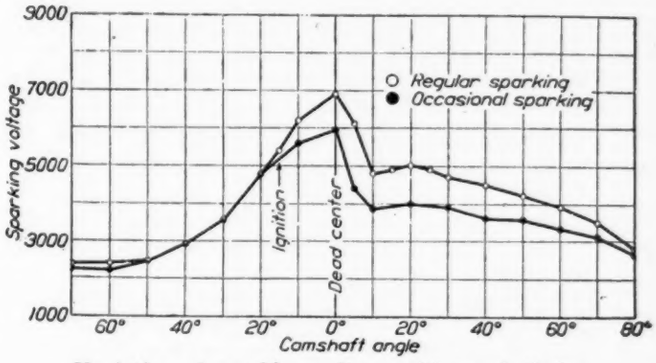
The principal effects of this time lag when an ignition system is used as a source of voltage are (a) irregular firing unless the maximum voltage which the system will give greatly exceeds that which at moments of least lag will produce a spark; (b) an abnormally high sparking voltage which may be measured with the type of crest voltmeter, which indicates the maximum voltage applied to the gap. So far as the point in the engine cycle at which ignition occurs is concerned, this lag is negligible.

It was found very early that these lag effects could be greatly reduced by illuminating the spark gap, and particularly the cathode, by ultraviolet light. A similar reduction results from X rays, radium radiation or any source which tends to increase ionization. In the operation of a plug in an engine the gas is diluted with exhaust gas from the preceding cycle, which gas is probably ionized as a result of the chemical action just completed in it, and the electrodes of the plug are hot and probably give rise to a certain amount of thermionic emission. Under these conditions comparatively little lag would be expected, and tests made at the Bureau of Standards seem to justify this expectation. In these tests the crest voltage was measured, and it was found that the "overshooting in voltage" when the current was double that at which sparking just began amounted to only 7 per cent, while in the open air with the plug cold the "overshot" was 35 per cent, and when illuminated with an arc lamp (ultraviolet rays) it was 17 per cent.

For ignition tests, both in the factory and in service, use is frequently made of sets of standard spark gaps which are intended to duplicate the condition of operation of the system either normally or more often with an arbitrarily chosen increase in severity. Such a set of test gaps is much cheaper and more convenient than any type of crest voltmeter.

The requirements of such a type of gap are ease of specification (few essential dimensions), constancy of voltage (freedom from eating away of points), freedom from time lag and ease of setting (i.e., voltage should change only slowly with gap length). The first two requirements are nicely met by the sphere gap, and this is the generally accepted standard for high voltage measurements. For the lower voltages used in ignition, however, the required gap length is very short, and the last of the requirements is therefore more difficult to comply with. For this reason recourse is had to pointed electrodes which satisfy the last requirement quite well but at the expense of the first two.

A gap between two sharp points is very bad as regards



Variation of sparking voltage with spark timing

the third item (freedom from time lag), and it is the universal custom to reduce time lag troubles by the use of a third or "teaser" electrode which is insulated from the rest of the circuit and is separated from the high potential main electrode by a small gap (0.1 mm.). With such an arrangement, as the voltage on the main electrode rises a tiny spark passes to the teaser electrode, to charge it and its support to some intermediate potential corresponding to its intermediate position with respect to the two main electrodes. This small teaser spark produces ionization in the main spark gap and thereby prepares it for sparking at the slightly later instant at which the voltage has risen to the sparking voltage of the main gap.

Testing Specification

The usual explanation of the ionization of the main gap by the teaser spark is that some of the ions of the teaser spark move bodily into the main gap, but recent experiments at the Bureau of Standards indicate that the ultraviolet light from a very feeble teaser spark at a distance of several centimeters is sufficient to "trigger off" the main gap even when a direct transport of ions to the main gap is prevented by a barrier of transparent quartz. For ignition testing purposes the following specification for a standard three point gap is proposed:

(a) Electrodes to be round wires of nickel alloy or platinum iridium.

(b) Diameter of each wire to lie between 1.50 and 1.60 mm.

(c) Each electrode to taper with an included angle of 44 degrees:

1. Tip of each electrode to be slightly blunted, the radius of curvature not to exceed 0.2 mm.
2. Tip of teaser electrode to be sharp.

(d) Axis of teaser electrode to be perpendicular to axis of main electrodes; tip of teaser to be 1 mm. back from tip of high-tension electrode; length of teaser gap to be between 0.1 and 0.2 mm.

(e) Gaps complying with the above conditions have breakdown potentials approximately as follows:

Length of Main Gap.	Breakdown Potential.
mm.	*Volts*
5.0	8,000
7.0	11,000

Average Sparking Voltage

Tests made on the safety spark gaps of five (aircraft) magnetos showed that the average sparking voltage was 12,000 volts, none of the voltages varying by as much as 10 per cent from this average. Considerable "overshooting" was noted, however, and at times as much as 25 per cent greater voltage was required to produce a spark. The safety gap is always adjusted to spark at a voltage well above the normal sparking voltage of the plug but lower than the breakdown voltage of the solid insulating material used in the machine. As the average sparking voltage of aircraft engines is 6000 volts, the safety gaps are adjusted to give a margin of 100 per cent over-voltage. In the case of battery and coil systems no safety gap is provided, and when a high tension terminal becomes disconnected the coil is allowed to build up the maximum voltage of which it is capable, which is usually between 10,000 and 15,000 volts.

When two spark gaps are connected in series (as with jump spark distributors, so-called spark intensifiers and two-spark magnetos), the voltage required is not generally the sum of the sparking voltages of the individual gaps. If one gap is shunted by a resistance, as, for instance, when a spark plug is even slightly fouled with carbon, practically the full voltage is concentrated on the clean gap, and this latter will break down when the total voltage is equal to its sparking voltage. The full voltage is thus immediately applied to the fouled gap, which in turn will spark, provided its sparking voltage is also exceeded.

When both gaps are clean the division of voltage between the two gaps is determined by the electrostatic capacity in parallel with each, If the capacities happen to be inversely proportional to the sparking voltages of the corresponding gaps, then the total sparking voltage will be theoretically equal to the sum of the sparking voltages of the individual gaps. Any other distribution of capacity will decrease the total voltage required to produce a spark. In a 2-spark magneto the capacity to the ground from one terminal is usually very much greater than that from the other.

Steam Heater Is Designed for Passenger Vehicles

A STEAM heating system applicable to passenger cars and buses is the latest development to be added to the evaporative cooling system designed by S. W. Rushmore, Rushmore Laboratory, Plainfield, N. J. It contemplates the use of steam heaters or radiators which can be placed inside the body of the car or bus.

As shown in the accompanying sketch, the radiator is placed in parallel with the main radiator used for engine cooling, but a simple pressure valve similar in principle to a common safety valve placed at the engine outlet is arranged in such a way that water and steam discharged from the engine will be forced through the heater in the car and thence returned to the main radiator until a predetermined pressure of about three pounds is reached. When this pressure is attained the pressure valve opens

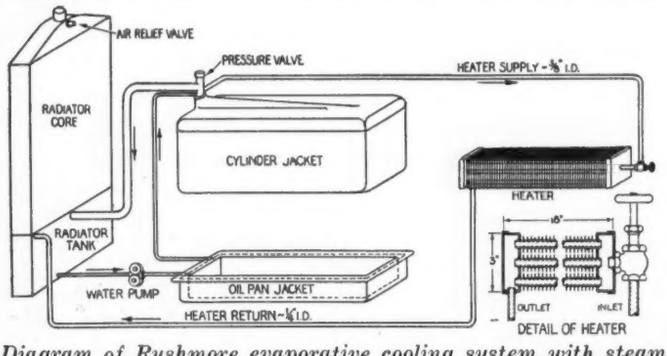


Diagram of Rushmore evaporative cooling system with steam heater for warming body of car added. A section of the heater, which is made from gilled tubes, is shown.

and a part of the steam and water pass direct to the main radiator, while a part continues to flow through the heater.

A valve placed at the heater inlet can be used to regulate the flow through it or to shut off this flow entirely. In the latter case, of course, all water and steam discharged from the engine jacket returns direct to the main radiator, since the pressure valve opens immediately and the system then functions in the same manner as the normal Rushmore system heretofore described in these columns and shown in the accompanying diagram, which indicates also the use of crankcase jacket designed to heat the engine oil with a view to minimizing dilution by fuel and evaporating water in the oil.

Advantages claimed for steam heating itself and as compared to exhaust heating include the following:

1—Small copper tubes, of ¼ and ⅜-in. in. inside diameter can be used in place of large exhaust tubing, thus making the heating element easy to install.

2—Heating starts almost as soon as the engine is started and continues as long as the engine runs. Even at idling considerable heat is supplied.

3—Temperature of piping and radiator never exceeds that of boiling water at the pressure involved, say 215 deg. Fahr., consequently loss of heat between engine and heater is minimized and the fire hazard is no greater than if no heater were used.

4—No cleaning of heater is required, as no carbon or other solid matter enters the heater. For the same reason the heater retains its efficiency indefinitely.

5—Heating elements can be placed at any desired points in the body.

No Traps or Check Valves

A heating element or radiator such as that shown in the diagram has nine ⅜-in. gilled tubes with a total heating surface of 14 sq. ft. and is capable of delivering about 130 B.t.u. per min. No air or water traps or check valves are required. The steam pressure is claimed to scavenge the system quickly.

It will be noted that the system is quite different from that in common use for house and train heating. It is said to resemble that used on foreign steamships in which water is forced through a number of radiators in series, thus permitting small pipes and overcoming drainage difficulties.

Heater tubes are soldered into a header at each end and the outlet is placed at the lowest point, so that the unit tends to drain toward the bottom tank of the main radiator. The control valve is placed at the inlet to the heater.

Here and There in Foreign Markets

By special arrangement with the Automotive Division, Bureau of Foreign and Domestic Commerce

Cuba Not Demanding Invoices

THE Cuban Secretary of State has given informal assurance that the Cuban consular officials in the United States are being instructed not to enforce, for the present, the new requirement, which was to have been put into operation at the end of February, whereby automotive products and other shipments subject to ad valorem duties were to be accompanied by the original manufacturer's invoice. This action follows the representations made through the Embassy and by commercial interests, pointing out the difficulty of complying strictly with the new requirement proposed. It is understood that the plan will be reconsidered and possibly modified somewhat before re-issue.

Auckland Show Opens July 11

THE Auckland Motor Trade Association of New Zealand has announced that the next Auckland Motor Olympia will be held from July 11 to July 16 inclusive. A large attendance is expected since the American fleet is scheduled to reach Auckland on July 16, and the Auckland Winter Exhibition will open on July 21. The Automotive Division is advised that dealers handling American cars are now arranging for space and, as a special effort is being made to secure a larger representation of British cars than was shown last year, American manufacturers should assist local dealers.

Spanish Market Healthy

CONSUL W. C. Burdett at Seville reports that Spanish automobile sales show a progressive increase, and at the end of 1924 approximately 5000 motor vehicles were registered in the Seville Province. Road construction is not keeping up with the increase of motoring and the average travel range of the cars is small. The demand is almost exclusively for small cars, and in this respect the Citroen, selling in Seville at the equivalent of $700, fully equipped, is highly favored and, at the end of 1924, ranked second in sales.

Labor Troubles in Germany

AN interesting automotive development during November in Germany was the increasing number of chassis imports which totaled 713, this amount being 11 per cent more than was imported during the entire third quarter of 1924, Vice Consul Erik W. Magnuson informs the Automotive Division. Exports of chassis numbered but 88 and have shown a steady decline since August.

"On account of wage disputes," he concludes, "a lockout was called on Dec. 10, by the branch of Sindelfingen, Wurttemberg, of the Daimler Motoren-Gesellschaft, involving 1000 men, which is still going on. A strike has also taken place at the automobile works of C. D. Magrius Aktiengesellschaft, Ulm on Danube, on account of wage troubles, where 1300 men have been out of work since Christmas."

Egypt Wants Light Trucks

A LIGHT truck chassis for bus purposes is the principal demand in Egypt according to a dispatch from Trade Commissioner May at Alexandria. The truck bodies, it is advised, are manufactured locally.

"Growing interest is manifest," continues the cable, "in automotive accessories and equipment with American lines being favored where the price is competitive with British, French, German and Italian goods.

"British makes of motorcycles continue to dominate the market principally on account of low price and light construction. While there is some interest in American makes, they are generally considered too high powered and expensive for use in this territory."

Heavy Increase in Taxes

INCREASED taxation on motor vehicles is contemplated in New South Wales, Vice-Consul W. T. Costello at Sydney cables the Commerce Department. The outstanding provisions of a new bill are as follows: Motor vehicles shall be taxed according to weight and not according to horsepower. Motor vehicles weighing over five tons which were previously exempted are to be brought under the new act and taxed according to weight. License fees of motor drivers, conductors and riders of motorcycles are to be doubled. Certain preferential rates now existing, which include the cars of doctors, clergymen, those used for private hire and trade motor vehicles will be abolished. Motor buses will be taxed according to weight but a reduction in the rate will be made to those motor buses which install pneumatic tires.

Peru Import Figures

THE Automotive Division of the Department of Commerce reports that the Peruvian imports during the fourth quarter of 1924 amounted to 357 passenger cars and 215 trucks, of which number the United States furnished 329 passenger cars and 211 trucks.

Designing of Cams Is Much Simplified by Graphical Method

Cams may be designed accurately and quickly to meet any given condition. Unnecessary to assume dimensions and check afterward to see if requirements have been met.

By W. D. Appel

THE following simple method of designing cams commends itself because of the ease and rapidity with which the desired results are obtained. It does not involve the use of mathematical formulæ which at best can be used only to check up a cam already designed.

The method is a graphical one and it is suggested that the design be laid out at least ten times actual size, so that the error due to inaccuracies in drafting becomes negligible. The advantage of this method over the analytical one is that we can lay down certain principles of cam operation and design a cam which will meet those conditions. For instance, if we wished to design a cam having a certain lift and a certain maximum acceleration and maximum deceleration, as well as a certain tappet clearance and velocity at the time the valve is being lifted off its seat, instead of assuming certain dimensions for our cam and checking back mathematically to see if we have fulfilled our conditions, we design the cam to the correct dimensions in the first place and know that it will function as desired.

The type of cam follower with which this article deals is the mushroom type—which is the one in most common use—because it happened that the method was developed in studying this particular type of follower. It can be applied also to the roller type, although it is then a little more complicated.

If an eccentric of certain dimensions is rotated at a uniform speed and a mushroom type of follower is raised and lowered thereby, this follower will have a simple harmonic motion, the lift, velocity and acceleration of which can easily be figured for any point of its motion.

How It Works Out

Let us assume that we have a circular cam with an eccentricity e inches (Fig. 1); that the same is revolving about its shaft at the rate of one revolution per second, and that its motion is used to raise and lower a mushroom type follower. Our tappet will then have a maximum positive and negative displacement e inches, making its total motion $2e$ inches. The amount of lift at any point is the distance of the point c above the line x-x. Lift represents the rise of the tappet above the center line and not above its lowest position. It is therefore seen that the lift for any angle α is equal to six α times the eccentricity e.

In the same way we know that the maximum positive velocity of rise of the tappet occurs when the center c is on the line x-x and moves upward and parallel to the tappet. Its value there is equal to the circular velocity of the point c of $2\pi e$ inches per second, and its velocity at any point is equal to $2\pi e \cos \alpha$ inches per second.

In the same way the acceleration will be found to have a maximum positive value of $4\pi^2 e$ inches per second per second, so that its value for any angle α is $-4\pi^2 e \sin \alpha$ inches per second per second.

By referring to Fig. 1, if the center c of our cam surface is above the line x-x and to the right of y-y, and its motion is uniformly counter clockwise, its lift at that point will be positive, its velocity will be positive and its acceleration will be negative. In other words, the tappet is being raised, but at a decreasing velocity. If the center were below the line x-x and to the left of y-y the lift would be negative, the velocity would be negative or downward and the acceleration would be positive or upward.

Summing up the above we find that with radius e and at one revolution per second our tappet has:

Maximum positive lift—e inches.

Maximum positive velocity—$2\pi e$ inches per second.

Maximum positive acceleration—$4\pi^2 e$ inches per second per second.

Lift at any angle c—$e \sin \alpha$ inches.

Velocity at any angle α—$2\pi e \cos \alpha$ inches per second.

Acceleration at any angle a—$4\pi^2 e \sin \alpha$ inches per second per second.

Speed Varies with Eccentricity

In the above formula we note that the greater the eccentricity e, the greater the lift, velocity and acceleration of the tappet, these functions varying directly with the eccentricity as long as the speed of the shaft is constant. If the speed of the shaft is varied it does not affect the lift, but increases the velocity of lift in direct proportion and affects the acceleration as the square of the speed. The basis of the whole method is that the distance e for any constant speed can be calculated to give a certain velocity or acceleration and our cam drawn to that scale. The writer always uses as a basis the functions of a cam having an eccentricity of one inch and revolving at one revolution per second, which have the following values:

Maximum lift—1 inch.

Maximum velocity—6.2831 inches per second.

Maximum acceleration—39.478 inches per second per second.

Let us design an eccentric cam revolving at 1800 r.p.m. and having a maximum acceleration of 4000 ft./sec.^{2}.

$1800/60 = 30$ revolutions per second.

Therefore, an eccentricity of one inch has a

Maximum lift of 1 inch.

Maximum velocity of 188.493 inches per second.

Maximum acceleration of 35,530.2 inches per sec.^{2} or 2960.85 feet per sec.^{2}.

We shall therefore require an eccentricity of $4000 \div 2960.85$ or 1.350 inches.

Our tappet therefore has a

Maximum lift of 1.350 inches.

Maximum velocity of 254.47 inches per second.

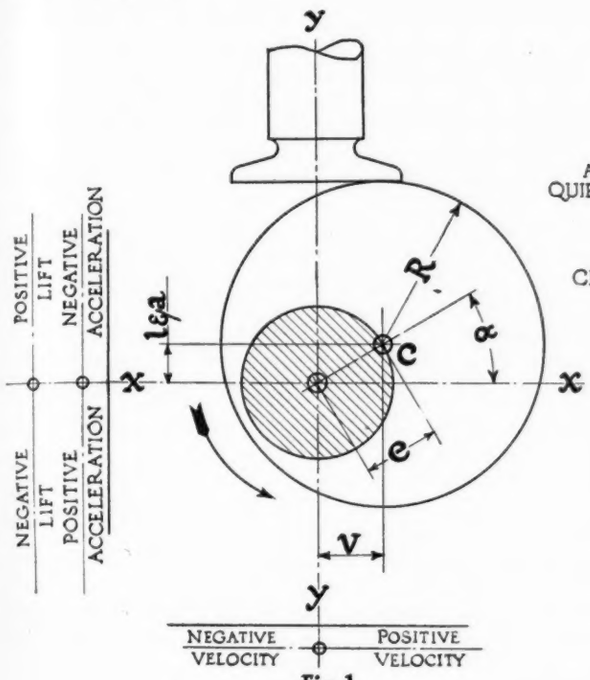


Fig. 1

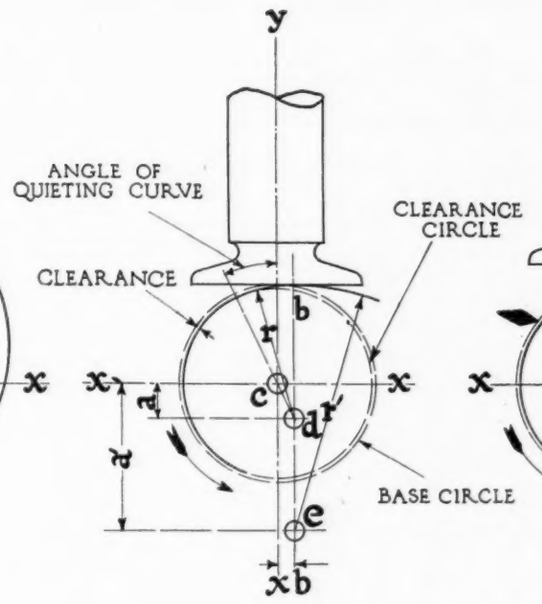


Fig. 2

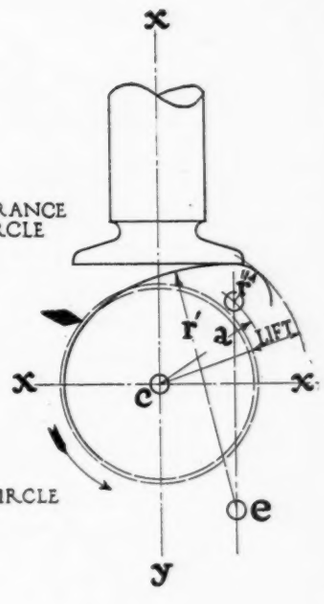


Fig. 3

Fig. 1—Eccentric lifting mushroom type cam follower
Fig. 2—Cam follower in position where clearance has been taken up
Fig. 3—Tappet at point where the flank and the nose of the cam join

Maximum acceleration of 4000 feet per second per second.

In the case of a single radius cam the maximum lift, velocity and acceleration are, of course, fixed and dependent upon one another, but with multi-radius cams these can assume independent values.

In constructing cams for internal combustion motors it becomes necessary that we have a definite lift of the valve, a definite acceleration and deceleration to the same and a definite velocity of the tappet at the time it strikes the valve, so that the noise shall not be too great. A certain clearance between the valve stem and tappet when the valve is seated is also specified to insure its seating in spite of temperature variation in these parts.

This necessitates the use of cams whose outline is made up of more than one arc. Since only one surface can act upon the tappet at one time, the design of such a cam simply resolves itself into the choosing of the proper radius which will produce the result we desire at that time.

First Step Illustrated

Fig. 2 illustrates the first step in designing a cam. Here we have shown the tappet in the position where it is about to lift the valve off its seat, it having been raised the amount of the clearance specified. At this particular point we wish to limit its velocity to a certain value and so, having determined the functions of an eccentric point one inch from the center at the particular speed at which this cam is to operate, we draw the line *b-b* parallel and at the proper distance to the right of the center of the camshaft. The center of the quieting curve must therefore be located on this line, if it is to have the specified velocity, and is drawn so that it is tangent to both the tappet and the clearance circle. We can see that as the cam was rotated anti-clockwise the tappet climbed up on the quieting curve until the tappet clearance was taken up. The greater the clearance specified the greater the angle necessary to do this.

The clearance having been taken up, we now begin to raise our valve as quickly as we can, since the quicker we raise it the longer the valve will remain fully open and the greater our valve-port efficiency becomes. In order that there be no change in velocity at this point, where the quieting curve and flank of our cam meet, the center of the latter must also be located on the line *b-b*, the distance below the center line *x-x* being determined by the acceleration desired.

This flank is carried out until it intersects the concentric line representing the desired lift of the tappet (Fig. 3), and an arc of small radius connects the two. Usually this arc joins the other flank, so that the cam has a round nose, although this is not always the case. When a line passing through the center of the flank radius and the center of the nose radius of the cam is parallel to the center line of the tappet, the acceleration drops instantaneously from positive to negative. The value of this deceleration is important, because it must be produced by the valve spring and is a function of speed and valve gear weight. It becomes a maximum when the center of the nose radius is on the line *y-y*. As in our previous examples, the distance from the horizontal line *x-x* to this round nose center represents the deceleration and is increased or decreased depending upon whether the nose radius is small or large. Of course, the larger the nose radius, the greater the angle from the point at which the valve opens to the point of maximum lift, and it may be impossible with a given duration of valve opening to design a cam to fulfill all functions. As the two sides of the cam are usually symmetrical it is only necessary to duplicate the side just designed, or if different values are desired the two sides can be designed independently.

Working with Specifications

Let us design a cam which has the following specifications:

Camshaft speed, 1000 r.p.m.
Base circle diameter, 1¼ inches.
Tappet clearance, 0.003 inches.
Velocity at point of valve lift, 0.5 feet per second.
Valve lift, 5/16 inches.

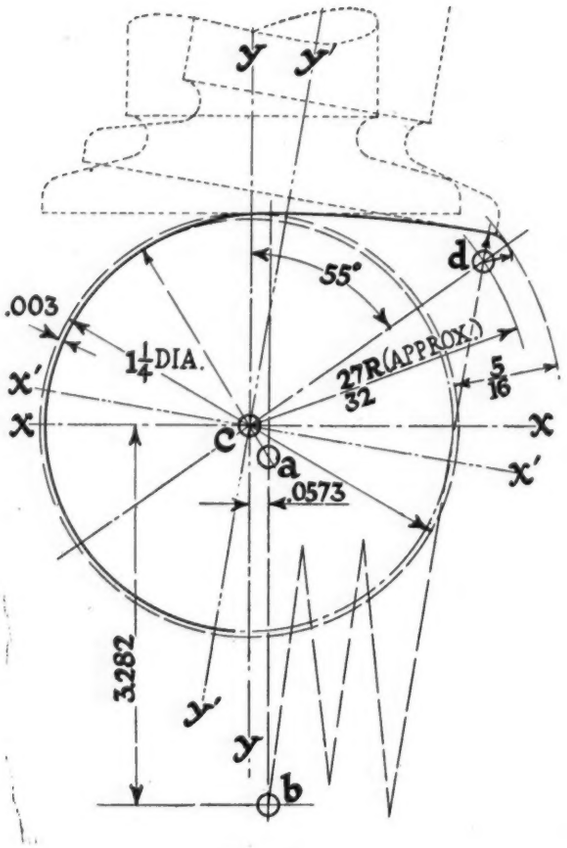


Fig. 4

Fig. 4—Drawing the cam

Maximum acceleration, 3000 feet per second per second.

Deceleration not to exceed 800 feet per second per second.

Duration of valve opening, 110 degrees.

A circular cam having a one inch eccentricity traveling at 1000 r.p.m. has the following functions which form the basis of our calculations:

Maximum lift, 1 inch.

Maximum velocity, 104.72 inches per second, or 8.726 feet per second.

Maximum acceleration, 10,967 inches per second per second, or 913.91 feet per second per second.

We first draw our base circle, which has a diameter of 1¼ inches, and then draw our clearance circle, which is 0.006 inch small in diameter (Fig. 4). As stated previously, this should be drawn at least ten times actual size so as to minimize the error due to drafting.

Locating the Centers

A tappet velocity at the point of valve lift of 0.5 foot per second is equivalent to 0.5/8.726, or 0.0573 inch on the diagram, so by drawing a line parallel to *y-y* and 0.0573 inch to the right of same we have located the line on which the centers of both the quieting curve and the flank arc should be located. The vertical location of the quieting curve radius at *a* is determined by the clearance which fixes this absolutely. The vertical location of the center of the flank radius is found as follows: Since the maximum acceleration occurs at this point, and we have limited the same to 3000 feet per second per second, the distance of this center below the camshaft center will be 3000/913.91 = 3.282 inches. Draw the flank radius until it intersects the concentric line representing the lift of the tappet and also draw the center line of the cam which, will be at 55 degrees from our vertical center line *y-y*. This will show the maximum radius that can be used on the nose of the same, and its distance from the center of the camshaft will give the maximum deceleration which the tappet will have. The deceleration of any point is measured by its distance above the line *x-x* and so when the center *d* (Fig. 4) is on the line *y-y* the deceleration is maximum. This deceleration will scale to approximately 27/32, which amounts to about 772 feet per second per second, so that we are within the 800 feet per second per second specified.

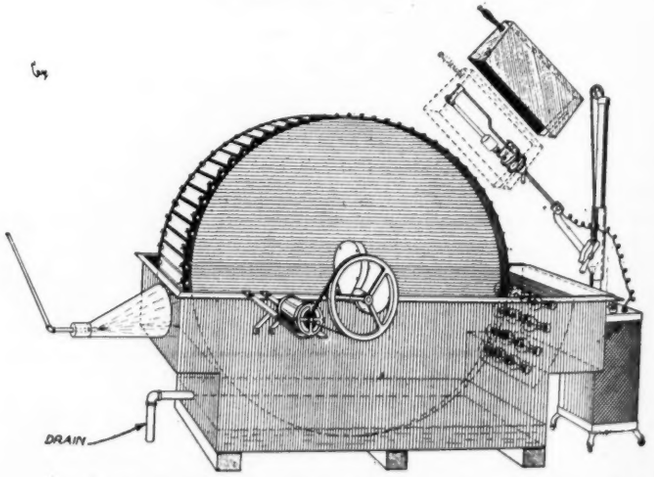
The cam shown in Fig. 4 therefore will exactly fulfill the conditions we have laid down, and no further calculation is necessary. By accurately scaling our dimensions off the layout, we can make the working drawing of our cam, since with reasonable accuracy it is possible to have the various radii correct to within a few thousandths of an inch.

Aging Tests of Varnish Films Accelerated by New Apparatus

IN a paper presented recently before the Cincinnati-Dayton Paint and Varnish Clubs an apparatus designed by H. A. Gardner and H. C. Parks for making accelerated aging tests of paint and varnish films was described substantially as follows:

The apparatus subjects test panels to four cycles: Heat, cold, rain spray and ultra-violet light. The entire apparatus is made of 10 gage galvanized iron. It consists of a revolving drum 5 ft. in diameter with a 14-in. face upon which the test panels are fastened. The drum accommodates 31 panels 6 x 12 in. and 1 in. thick. Such panels are of greater size than used in most testing cabinets previously constructed. They afford sufficient surface for brushing or spraying a coating under test. The drum revolves on bearings fastened to the sides of a tank 3 ft. deep, arranged for holding ice water or refrigerating pipes.

Panels first pass in front of a rain spray furnished by a Schutte-Koerting spray nozzle No. 622-B, then pass below an ultra-violet light furnished by a mercury quartz tube of the Cooper-Hewitt type No. BW-040. The panels next pass in front of a battery of twelve 100 watt electric bulbs which give the desired heating effect. They then pass into ice water or over a series of refrigerating pipes to secure the desired cooling effect. The last two cycles may duplicate the strains developed on automobile finishes when a car is driven from a heated garage into the open air on a cold morning. The rain spray and the ultra-violet light might be considered equivalent to alternate exposure to thunder storms and strong sunlight.



Apparatus for making accelerated aging tests of paint and varnish films

Books for the Business Bookshelf

THE gasoline extracted from natural gas is an important factor in the motor fuel situation at the present time. While the yield of this source constitutes only 7 per cent of the total production, the addition of this light, volatile hydrocarbon makes possible the inclusion in the marketed fuel of a considerable proportion of heavy fractions, and George A. Burrell in a recently issued volume on The Recovery of Gasoline from Natural Gas (published by the Chemical Catalogue Company, Inc., New York) estimates that in this indirect way natural gas gasoline makes satisfactory for motor fuel at least 20 per cent of the total gasoline production of the country.

Burrell's book covers the subject of natural gas gasoline in a comprehensive way. It deals with its history —which dates back only to 1903—the theories underlying the practice of the industry, with the construction and operation of plants and with the equipment used. Brief sections are devoted to other motor fuels.

PROFITABLE ELECTRICAL SERVICE is a 48-page book just got out by the Automotive Electric Association, 5363 Hamilton Avenue, N. E., Cleveland, Ohio. This business manual has been prepared for the use of battery dealers and service stations specializing in maintenance work on automotive electrical equipment. It is being supplied free of charge to those having direct service or sales relations with manufacturers who are members of the Automotive Electric Association. Electrical service stations and battery dealers in the past have been liberally supplied with technical information and service instructions direct by individual manufacturers. This booklet represents a cooperative effort to supply information of a commercial nature which will be an influence for better business methods. There are chapters on the following subjects: Specialized Electrical Service, the Authorized Service Station, the Ideal Service Station, Special Equipment for Service Stations, Bookkeeping for Service Stations, Determining the Service Charge, Profitable Shop Management, Stock Inventory Systems, Merchandise Activities in Relation to the Service Shop, Advertising, Credit Policies, Increasing Battery Sales, When Should a Battery Be Repaired? Charging for Battery Service, Battery Guarantees, Mail Order Competition, Special Dope Electrolytes.

"GRAPHIC ANALYSIS FOR EXECUTIVES," by Winfield A. Savage, president Business Research, Inc., deals with charts and chart methods of visualizing facts. In this volume the author discusses corporation statistics from the angle of the man inside the organization rather than from an outside viewpoint.

The illustrations have been taken largely from actual examples which have proved their usefulness. The subject matter includes charts on administrative control, sales, budget control, routine and organization. It is published by the Codex Book Company, Inc., New York.

WE have received a copy of the 1925 edition of The Mechanical World Yearbook which is published annually by Emmott & Co. of Manchester, England. This handbook is of the same general character as the engineering handbooks which are so widely used by engineers and designers at the present time, though of less extensive scope. It gives data pertaining chiefly to the fundamental branches of mechanical engineering, including steam boilers and engines, power transmission, oil and Diesel engines, structural iron and steel work, toothed gearing, limit gages, micrometers, ball and roller bearings, friction and lubrication, etc. Mathematical tables, which usually form the introductory part of engineering handbooks, are here given at the end.

NEGLECT of the storage problem has been one of the chief difficulties in the coal situation, according to John Hays Hammond. "The operators have said that storage is the duty of the railroads, whereas the carriers have contended that it is the duty of the consumer, and as a result storing has been neglected," Mr. Hammond says in the foreword which he has written for "Industrial Coal," a recent publication of the Ronald Press Co., 20 Vesey Street, New York City. The book is a report of the American Engineering Council on the purchase, delivery and storage of coal, and as a solution to the problem outlined by Mr. Hammond, the report urges "that the consumer, potentially the largest benefactor, should apply the needed balance wheel through himself initiating storage." The price of the book is $5.

WE have received copies of three papers dealing with various phases of the use of aluminum alloys in the industry, all of which were presented to the American Foundrymen's Association at its recent meeting at Milwaukee. One of them deals with A New Aluminum Alloy—Alpax, the author being Leon Guillet of Paris, the paper having been translated by Robert J. Anderson of Boston. Both of the other two papers are by Robert J. Anderson and M. Edward Boyd, the latter of Clinton, Mich. One deals with Salvage and Reclamation of Aluminum Alloy Castings by Soldering and Welding; the other with The Production of Aluminum Alloy Pistons in Permanent Molds. These various papers contain a great deal of practical information on their respective subjects and should interest manufacturers and users of aluminum castings.

A BROCHURE, showing sources of foreign credit reports, calculated to be of service to American exporters, has been prepared by the U. S. Department of Commerce, and can be had by writing the Department for Trade Information Bulletin No. 292, either at Washington or any of the Department's branch offices. The pamphlet is compiled from information obtained in foreign markets by representatives of the Departments of State and Commerce, and lists banks throughout the world.

A NON-TECHNICAL Summary of Research on the Application of Leather Belting, by the Leather Belting Exchange Foundation, has been published by the Foundation, whose address is Cornell University, Ithaca, N. Y. Among the factors dealt with in the summary are pulley diameter, pulley ratio, center distance, effect of high belt speeds, gravity idler and new rating curves and tables for leather belting. The summary was prepared by R. F. Jones, research engineer.

"The Land of Cotton"—Nation's Greatest Untapped Market

Recent Prosperity and New Highways Create a Growing Demand for Motor Vehicles in South

By Harold F. Podhaski

THE biggest potential automotive market in America today lies below the Mason-Dixon line. The manufacturer who directs his future sales efforts in the light of facts and figures will do well to set aside a generous portion of his total "new business" appropriation for coverage of the southern field.

General prosperity in this section has been built up steadily during the past two years. The commercial stagnation which developed after the war has been shaken off. Favorable crop conditions have existed for the cotton grower, and the demand for his product, especially during the past year, has been stabilized to such an extent that prices have held firm at a point which has provided him with a fat purse.

The South has needed increased motor facilities for years. Now it is in a position to get them. Restricted purchasing power is no longer an obstacle in the path of the automotive industry in its invasion of this great territory.

The field for truck, bus and tractor sales is especially inviting, and it is with these classes of vehicles particularly in mind that this article is written.

Temporary Lull Explained

It should be mentioned that members of the National Automobile Chamber of Commerce who met in New York City early in March made a report on automotive trade conditions in the Southeast which was not altogether favorable. This report, however, was very likely based on a temporary situation which can be traced back to January and which is described as follows in the monthly business review issued by the Federal Reserve Bank of Atlanta under date of Feb. 28:

"Weather conditions during January constituted the principal deterring factor in business and agricultural conditions in the sixth district. There were excessive rains over a large part of the district. In a number of places roads were rendered impassable for a time and transportation seriously interrupted. Farm work in preparation for the coming season's crops was practically suspended, lumber mills at many points were forced to close down for several days, and naval stores operations were interfered with for nearly a month."

The "excessive rains" in many instances resulted in floods which did considerable damage and business naturally suffered. The lull was only temporary, though; at the present time an almost complete recovery has been effected.

Only a week ago AUTOMOTIVE INDUSTRIES, in a nation-wide survey of automotive marketing conditions, received its most favorable reports from Southern commercial centers. Atlanta, for example, reported that in that district there was a marked improvement in truck and bus sales over last year. The spring and summer outlook for those two lines was better than it had been for three or four seasons. Industry was operating on an active basis. New car sales were slightly better than a year ago. The market for low and medium priced cars was particularly good in rural communities.

In Birmingham dealers reported a steady though slow improvement in automotive sales conditions. The sales of low and medium priced cars were decidedly better than for some months previous. General business was good and the dealers were optimistic, seeing a good season ahead.

In Dallas the situation showed improvement in February. The demand was brisk and stocks were short.

New car stocks were low in Louisville, with the demand good and prospects for an active spring trade unusually bright.

The whole economic structure of the South is based primarily on cotton crops and prices. When these are conducive to a good margin of profit for the planter interests a tremendous purchasing power is created and prosperity reigns. Last year more than 13,000,000 bales of cotton were produced, and for many months now prices have been maintained on a more stable basis than ever before in the history of an industry which traces its beginning back to the romance and traditions of Colonial days. The growers have been receiving between 23 and 24 cents a pound. At this figure they have realized profits which have added millions to the treasure chests of Dixie.

Road Building Another Factor

Cotton is the first factor in the increased demand for motor vehicles, but there is still another which should not be overlooked. It is a well known fact that roads have been neglected in the South. In the past poor economic conditions retarded development along this

> "PURCHASES of motor equipment by the South in 1924 were relatively heavy, but should be regarded only as a beginning if we may reasonably expect the South some day to stand on an equal basis with the rest of the country in the use of automotive products.
>
> "Alabama, for instance, after increasing its motor vehicles by almost 25 per cent last year, is still the last State in the Union in point of persons per vehicle, its average being one to every 15.55 persons.
>
> "Compare this with California's record of one vehicle to every 2.96 persons!"

line. But along with the wave of general prosperity has come renewed activity in modern highway construction, and as miles of smooth, hard-surfaced roads are opened to the public the desire for motor vehicles is quickened.

In the past lack of good roads has unquestionably proved one of the greatest drawbacks to increased truck and bus sales in the South. If the roads did happen to be good, bridges frequently were in bad shape, or vice versa. And, of course, industrial concerns will not subscribe heavily to the motor truck mode of transportation when such conditions prevail. As regards the bus, the successful operation of routes under such conditions is not only impractical but impossible.

But now this situation is changed, or is being changed, very rapidly. Within the past year conditions have been remedied broadly; there are good roads and good bridges now in every section of the South, or there will be before the end of 1925. Within the past two years the southern States have invested millions in road building and maintenance, more millions than they ever invested before, and the 1925 building programs that have been announced by the State highway departments of the sixteen southern States, much of this work being already under way, calls for the investment of still more millions—making 1925 the greatest road building year in the South's history.

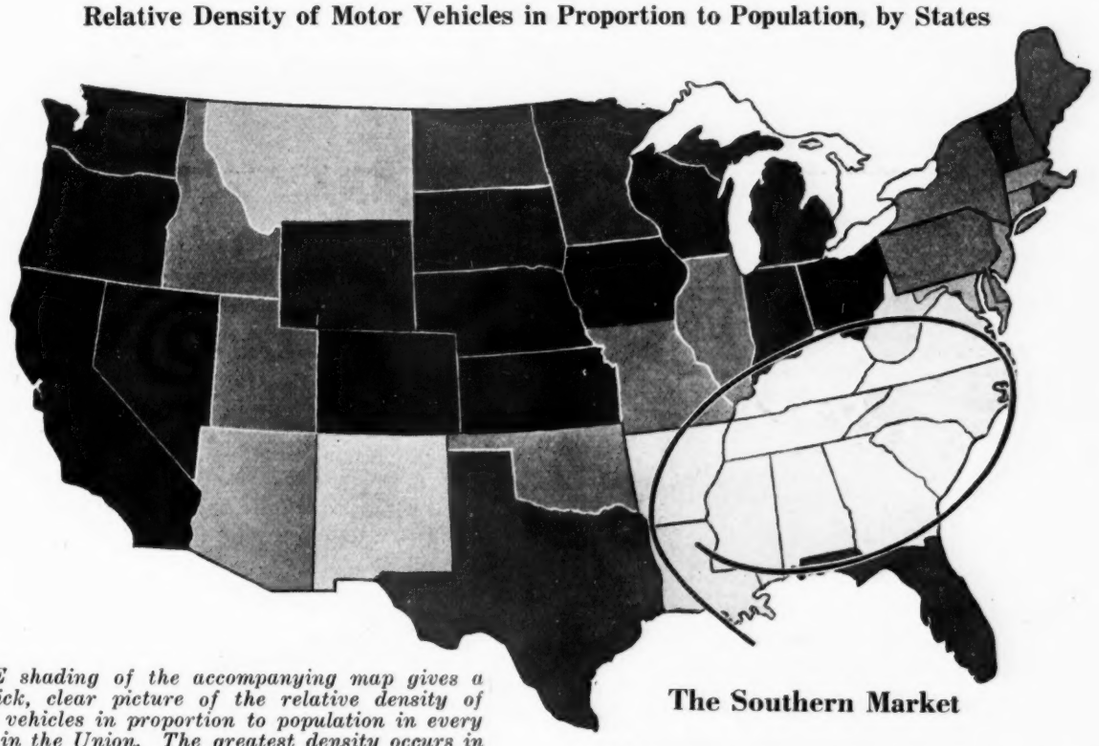
The Case of North Carolina

Just as a tangible evidence of what this will mean to the automotive industry, take the case of the State of North Carolina. This is one southern State at least that has boasted the best of roads for years, and it is one southern State where motor bus and motor truck sales have increased hundreds of per cent the past two or three years, while they were only increasing slowly in other southern States. But with these other southern States now building roads that will equal, or even surpass, those in North Carolina, this market is being fast opened up as a fertile and profitable field for factory sales effort—a market that is certain to produce millions of dollars' worth of motor truck and bus business during the next five years.

For the bus industry the outlook is particularly good, as 1924 saw the formation of 50 per cent more independent bus companies in the various southern States than existed at the end of 1923, especially in Georgia, Florida, North Carolina and the eastern half of Tennessee, where road building was the most active. The good road construction that is planned for the present year will witness the further development of this industry on an even greater basis than in 1924.

Thus, cotton crops and road building have combined to produce an extremely favorable market condition for all types of automotive products.

Relative Density of Motor Vehicles in Proportion to Population, by States



THE shading of the accompanying map gives a quick, clear picture of the relative density of motor vehicles in proportion to population in every State in the Union. The greatest density occurs in California, which has one vehicle to every 2.96 persons. The shading of the other States grows gradually lighter according to their respective density ratings, until the other extreme is reached in Alabama, which has only one vehicle to every 15.55 persons. By far the largest, unbroken light area is found in the South, although Florida, with one vehicle to every 5.48 persons, is a striking contrast.

The Southern Market

What the Figures Show

How is the market actually reacting to these conditions? How does the South already compare with other sections of the country in motor vehicle registration? What are the figures from which the automotive manufacturer can base his conclusions and shape his future sales campaigns so that the South will take its proper place in the national merchandising scheme?

In 1924, eight of the ten States which showed the highest increases in motor vehicle registrations for the year were in southern territory. These States and the percentage increase in each case over 1923 are as follows:

	Per Cent		Per Cent
Mississippi	28.50	Alabama	24.25
Louisiana	28.50	North Carolina	23.50
South Carolina	27.10	Florida	21.30
Arkansas	26.85	Texas	21.00

Twelfth in the list of all the States came Georgia, with a gain of 20.50 per cent; Virginia was fifteenth, with 19.40 per cent; Tennessee was seventeenth, with 18.10 per cent; West Virginia was eighteenth, with 17.20 per cent, and Kentucky stood twenty-third on the list, with a gain of 16.86 per cent.

Yes, the South is buying—putting into motor vehicles the profits derived from cotton!

As the figures show, purchases of motor equipment in 1924 were relatively heavy, but should be regarded only as a beginning if we may reasonably expect the South some day to stand on an equal basis with the rest of the country in the use of automotive products.

Alabama, for instance, after increasing its motor vehicles by almost 25 per cent last year, is still the last State in the Union in point of persons per vehicle, its average being one vehicle to every 15.55 persons. Compare this with California's record of one vehicle to every 2.96 persons!

Still at Bottom of List

As a matter of fact, every one of the last ten States in point of persons per motor vehicle for 1924 are in the South, and all but two of the thirteen included in this section are considerably below the average of 6.33 established for the nation as a whole, as the table will reveal:

Persons Per Motor Vehicle, Jan. 1, 1925.	
Florida	5.48
Texas	6.01
West Virginia	8.28
North Carolina	8.95
Virginia	9.25
Louisiana	10.44
Kentucky	10.71
South Carolina	10.79
Tennessee	11.79
Arkansas	12.96
Mississippi	13.35
Georgia	14.47
Alabama	15.55

This gives a clear picture of the density of motor vehicles in proportion to population and furnishes some idea of the quantity of automotive products which the South must absorb before it begins to compare in this respect with most of the northern and western States. The market has scarcely been scratched as yet.

Georgia, with a population almost as large as California, had, according to the 1924 registration, a total of 209,300 motor vehicles, as against California's 1,321,480. Alabama's population is almost identical with Iowa's, yet the former boasts only 157,262 motor vehicles as against 620,906 in Iowa. South Carolina's population is larger than that of Nebraska, yet the latter has almost twice as many motor vehicles. And so on down the list.

Status of All Classes Improving

It may properly be argued that the percentage of "poor folks" in the South who cannot hope to own motor vehicles is considerably higher than in other States, but the status of the lower classes is improving steadily and will continue to improve in direct ratio with the improvement in general economic conditions, so that in the course of time we may expect to find the South as universally prosperous as any other section of the country.

A concrete example of what one company has accomplished in the development of this field in the last few years is furnished by the history of the Mack-International Motor Truck Corporation. In November of 1920 this company first made its sales entry into the southern territory, with a branch in Atlanta. This branch was, and still is, under the direction of H. A. Lorick as manager of the Atlanta and Georgia sales, with P. J. Degnon, vice-president of the corporation, in charge of the whole southern field, handled largely through the Atlanta branch.

A campaign was mapped out, dealers were duly appointed, and the campaign began to get under way. The Mack being one of the highest priced trucks on the American market, naturally there were multitudinous difficulties to be overcome, not only in the securing of dealers to handle the line, but in the building up of sales among industrial users, for in southern commerce at least, a truck of this price was almost unheard of.

Tremendous Business Increase

It is not necessary to enter here into any discussion pertaining to the methods used, but sales of the Mack company have mounted on a steady and rapid basis the past four years, with business at the end of 1924 witnessing an increase of 500 per cent in the sales volume in this territory.

And the Mack corporation has evidenced its great confidence in the future of this market by investing a million dollars during the past year developing the territory.

At present this company is operating fifteen branches in various important centers in the southern States and every one of these branches is practically a new plant, most of them constructed within the past year for the exclusive use of this company. These branches are located at Chattanooga, Knoxville, Nashville and Memphis in Tennessee; at Birmingham and Selma in Alabama; at Richmond and Norfolk in Virginia; at Jacksonville, Tampa and Miami in Florida; at Louisville, Ky.; Charlotte, N. C.; New Orleans, La., and Atlanta, Ga.

The last-named is the main branch of the company, handling twelve of the southern States and part of Texas and Indiana.

Largest Branch in South

The new branch in Atlanta was completed and formally occupied in January. It is the largest and one of the finest plants of this kind to be found anywhere in the South. The new branch at Birmingham, Ala., also completed and occupied recently, is but a trifle smaller than the one in Atlanta. All of the branches in the South, as above stated, are housed in comparatively new buildings, occupied by the Mack corporation within the past six months.

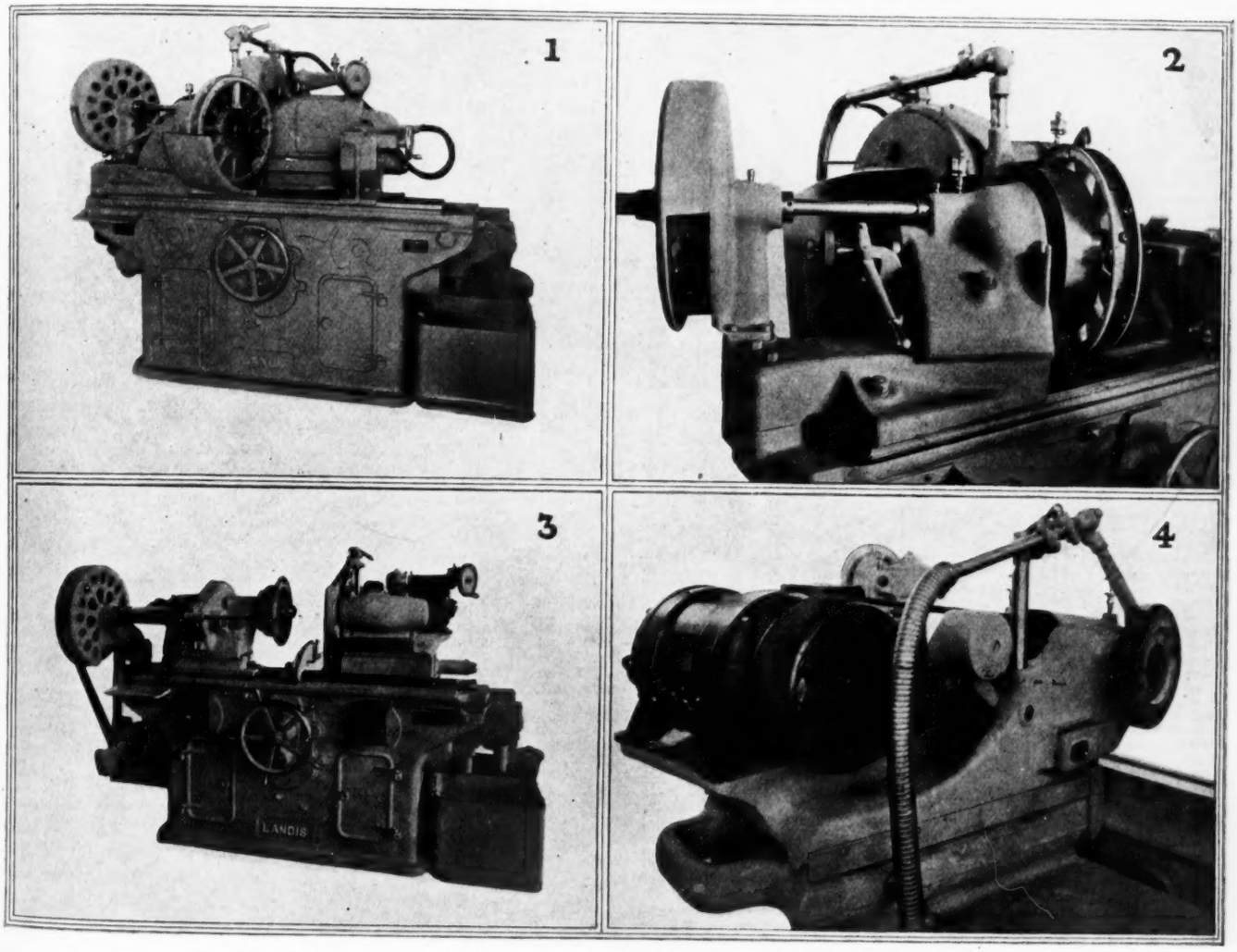
The plant in Atlanta provides more than 50,000 sq. ft. of floor space for sales, service, parts and administrative offices. The parts department alone contains more than 6000 sq. ft. of floor space, carries an average parts stock of an inventory of about $125,000, and is the largest department of this kind in the southern field. Big stocks are also carried at all the other southern branches, and a large investment in each case is tied up in fixtures, tools and machinery, trucks and buses, the total of which will reach many millions of dollars.

Proof that this southern market is worth cultivating is found in the sales reports for January, 1925, of the Atlanta branch of this company. During the first half of the month the volume of business was almost twice the total sales for all of January, 1924.

There is plenty of business to be had in the South the next few years for those manufacturers who will take the trouble to go after it and who are willing to back up their judgment with capital. Industrial and commercial concerns, traction companies and independent bus operators are planning to spend millions of dollars for trucks and buses in the South during the next two years.

Machine Built to Grind Brake Drums

Four-wheel brakes call for smaller clearances between the drum and brake in release position and thus make grinding necessary



Landis grinder specially designed to grind brake drums while mounted on the wheel

A MACHINE equipped specially for grinding automobile brake drums is now being made by the Landis Tool Company, Waynesboro, Pa. The machine is arranged for grinding either external or internal brake drums in all current sizes.

Advances in automobile equipment, such as balloon tires and four-wheel brakes, have made it necessary to fit these cars with brake drums that are true. The use of the four-wheel brake has made it necessary to increase the leverage in the brake mechanism very materially, which can be done only if the clearance of the brake when released is reduced.

Fig. 1 shows the machine with the wheel mounted in place on the holding fixture ready for grinding. The collet lever, draw rod and clamping bushing are also shown. Since the drum face extends under the rim of the wheel, the headstock is thrown at an angle so that the grinding wheel will clear the rim. The grinding wheel is dressed off at an angle to correspond to the angle of the headstock by means of the profile truing fixture shown on the machine. Fig. 2 shows a close up of the headstock with the wheel and drum mounted, along with the collet lever for operating the work holding fixture.

Fig. 3 is a front view of the machine arranged for internal grinding. In order to obviate the necessity for using a cup grinding wheel, the grinding wheel head has been thrown at an angle and the grinding wheel is dressed off at an angle with the diamond located at the back of the grinding wheel. Fig. 4 shows a close up of the self-contained grinding wheel head with the wheel drive motor, driving belt, water nozzle and grinding wheel guard in position. This machine carries a 10-in. diameter grinding wheel rigidly mounted on a heavy spindle, thus eliminating the difficulties usually encountered when the grinding wheel is mounted on the regular internal fixture. Its rotation is such that all grindings are directed downward into the water channel.

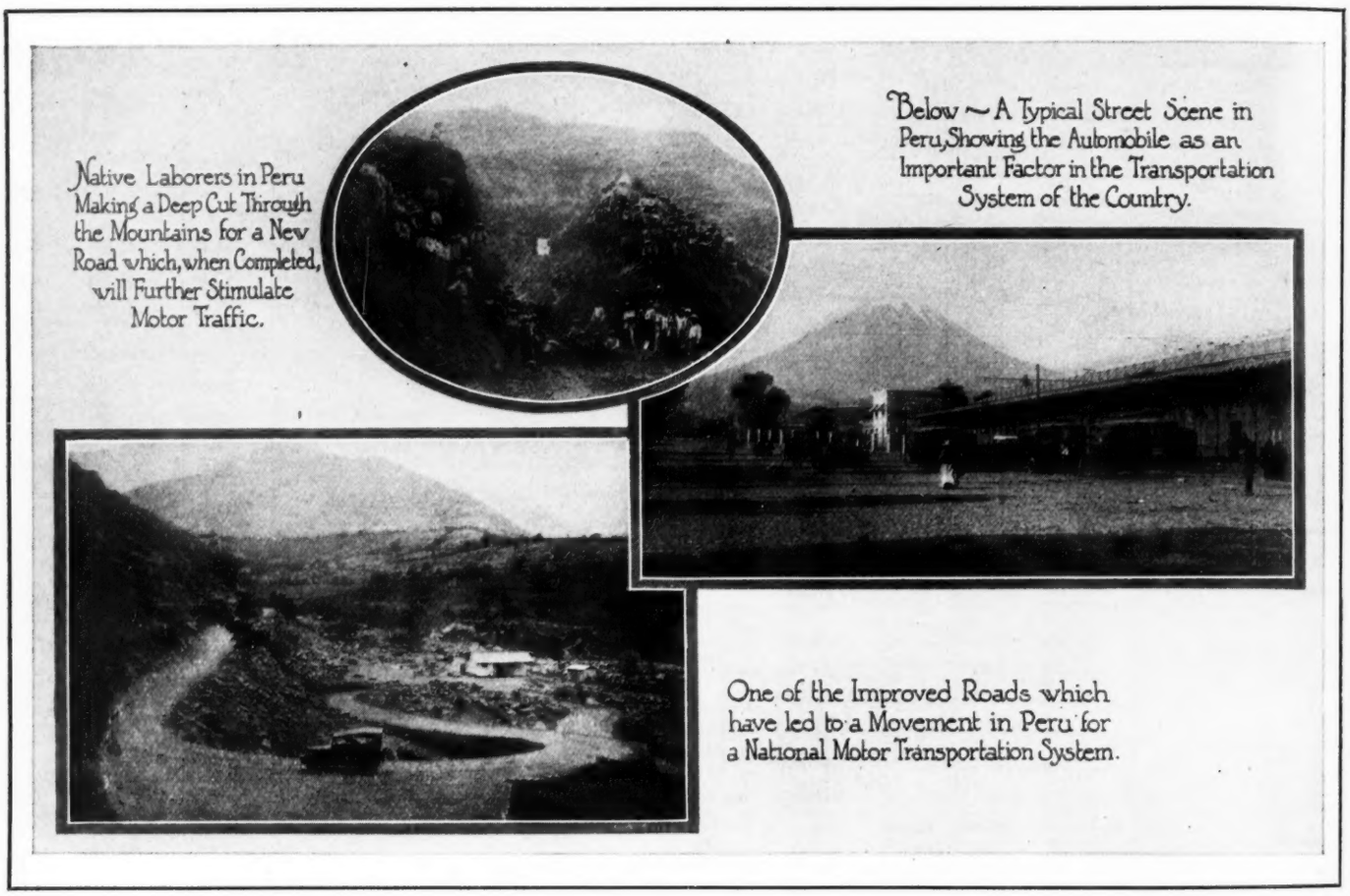
Agricultural Tractor Exports 1923-1924

Countries	1923								1924							
	Garden		Wheel		Track Laying		Total		Garden		Wheel		Track Laying		Total	
	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value	No.	Value
Europe																
Azores and Madeira			1	$351			1	$351			5	$1,906			5	$1,906
Belgium			769	288,029	76	$53,675	845	341,704			1,137	416,008	3	$2,733	1,140	418,741
Bulgaria											7	5,734	2	2,029	9	7,763
Czechoslovakia													1	2,060	1	2,060
Denmark			1,222	431,230			1,222	431,230	103	$13,978	1,933	776,296			2,036	790,274
Esthonia			81	30,190	2	1,370	83	31,560			4	1,535			4	1,535
Finland	1	$175	102	36,673			103	36,848	1	180	15	11,700			16	11,880
France	1	159	1,208	495,937	15	12,390	1,224	508,486	7	2,800	1,422	703,240	87	61,439	1,516	767,479
Germany	1	137	16	16,187	1	1,739	18	18,063	1	186	605	255,680	1	3,619	607	259,485
Gibraltar			1	900			1	900								
Greece					2	8,418	2	8,418			2	960			2	960
Hungary											45	35,493			45	35,493
Iceland			7	1,970			7	1,970								
Italy			545	193,976	2	2,800	547	196,776	4	559	1,962	808,086			1,966	808,645
Latvia	51	8,404	227	99,693			278	108,097			11	7,421	1	5,887	12	13,308
Lithuania			4	3,000	10	12,500	14	15,500								
Malta, Gozo and Cyprus Islands			10	3,682			10	3,682			7	2,987			7	2,987
Netherlands			13	8,809	22	13,300	35	22,109	10	2,166	105	38,880			115	41,046
Norway			15	5,466			15	5,466								
Poland and Danzig	2	259	50	15,149			52	15,408			2	740	1	3,800	3	4,540
Portugal			3	2,039			3	2,039			6	2,661			6	2,661
Rumania											6	4,746			6	4,746
Russia			354	151,914	2	15,850	356	167,764			353	175,594	8	31,822	361	207,416
Spain	26	6,609	482	171,199	9	6,375	517	184,183			210	82,482	16	8,549	226	91,031
Sweden			52	28,566			52	28,566	3	2,300	1,233	536,869	7	29,831	1,243	569,000
Switzerland					10	7,250	10	7,250			2	1,550			2	1,550
Turkey	15	5,550	91	34,234			106	39,784			147	55,696			147	55,696
Ukraine			142	55,810			142	55,810			1,006	447,667			1,006	447,667
England	25	3,562	1,433	570,877	31	63,535	1,489	637,974	2	303	1,063	506,521	21	56,765	1,086	563,589
Scotland					2	1,708	2	1,708			1	1,738			1	1,738
Ireland			60	22,417			60	22,417			90	35,753			90	35,753
North and South America																
Canada	24	3,548	5,931	4,516,030	62	191,430	6,017	4,711,008	64	15,655	1,967	1,425,679	33	71,453	2,064	1,512,787
British Honduras			47	32,424	8	27,252	55	59,676	2	490	29	12,238	16	58,002	47	70,730
Guatemala			6	5,701			6	5,701			2	1,788	3	10,108	5	11,896
Costa Rica			1	492			1	492			2	796			2	796
Honduras			20	20,620	5	15,551	25	36,171	8	1,012	4	1,333	5	5,156	17	7,501
Nicaragua			3	1,748	1	2,750	4	4,498			4	6,255	2	7,775	6	14,030
Panama			3	2,276			3	2,276			3	1,211	2	7,028	5	8,239
Salvador			1	720			1	720			37	24,024			37	24,024
Mexico	84	2,085	182	102,913	27	101,620	293	206,618	17	4,665	295	205,917	38	91,144	350	301,726
Newfoundland and Labrador			2	721	7	21,705	9	22,426			2	796	6	24,624	8	25,420
Bermuda	1	198					1	198								
Barbados	2	340	3	1,076	1	5,468	6	6,884			1	426			1	426
Jamaica			4	3,639	1	2,335	5	5,974	2	584	10	5,687	6	11,533	18	17,804
Trinidad and Tobago			8	4,515			8	4,515			15	16,281			15	16,281
Other British West Indies	8	1,390	3	1,091			11	2,481			1	1,000			1	1,000
Cuba	3	499	370	174,985	36	128,049	409	303,533			458	212,408	133	291,762	591	504,170
Dominican Republic			14	5,013	5	2,240	19	7,253			7	9,727			7	9,727
Dutch West Indies			2	741			2	741								
French West Indies			11	4,063			11	4,063			12	4,654	1	908	13	5,562
Haiti			4	6,147	1	4,450	5	10,597			2	702			2	702
Virgin Islands	1	170					1	170								
Argentina	58	13,149	2,087	1,276,764	19	59,554	2,164	1,349,467			2,428	1,770,019	102	143,414	2,530	1,913,433
Bolivia			3	1,557			3	1,557			5	3,354			5	3,354
Brazil	2	231	231	82,976	3	14,125	236	97,332			562	265,216			562	265,216
Chile			70	24,782	23	11,220	93	36,002			320	152,593	2	6,972	322	159,565
Colombia	3	621	24	31,683	14	28,563	41	60,867	4	1,480	29	24,465	7	32,921	40	58,866
Ecuador			9	7,783	7	7,735	16	15,518			17	8,812	11	11,633	28	20,445
British Guiana			26	12,418	10	38,260	36	50,678	1	561	5	4,655	5	24,424	11	29,640
Dutch Guiana											1	740			1	740
French Guiana											2	759			2	759
Paraguay											9	3,424			9	3,424
Peru			147	65,020	3	3,383	150	68,403			310	165,659	6	3,650	316	169,309
Uruguay	19	1,630	161	72,064			180	73,694	1	161	292	131,456			293	131,617
Venezuela			9	21,221	7	41,955	16	63,176			27	13,031	8	38,646	35	51,677
Asia																
Aden	1	109					1	109								
British India			29	56,659	15	31,246	44	87,905			64	63,378			64	63,378
Straits Settlements					3	3,995	3	3,995			1	605	2	3,615	3	4,220
China			4	5,253			4	5,253	1	197	5	5,750			6	5,947
Java and Madura			1	576	1	4,340	2	4,916			3	9,050			3	9,050
Other Dutch East Indies											3	4,975			3	4,975
Far Eastern Republic			5	6,130			5	6,130								
rench Indo China					1	539	1	539			2	852			2	852
Hejaz, Arabia and Iraq			1	365			1	365			5	4,052			5	4,052
Hongkong			2	650			2	650								
Japan	51	10,323	52	25,541	37	123,516	140	159,380	19	2,608	44	17,971	30	92,292	93	112,871
Kwantung			1	971			1	971			13	8,959			13	8,959
Palestine and Syria			46	19,520			46	19,520			37	15,882			37	15,882
Persia											1	375			1	375
Philippine Islands	1	223	51	23,634	3	11,274	55	35,131			64	23,644	3	10,592	67	34,236
Russia											6	4,729			6	4,729
Siam			1	659			1	659			3	1,397			3	1,397
Turkey											31	12,439			31	12,439
Oceania																
Australia	1	169	2,582	1,746,513	259	299,348	2,842	2,046,030	23	6,957	3,997	2,749,347	83	154,268	4,103	2,910,572
Other British Oceania			17	30,109	2	9,133	19	39,242			6	7,334	21	42,525	27	49,859
French Oceania			1	1,025	1	950	2	1,975			5	1,951			5	1,951
New Zealand	1	180	81	54,214	1	1,648	83	56,042	6	806	798	386,052	11	20,178	815	407,036
Other Oceania											2	787			2	787
Africa																
Belgian Congo			11	4,594			11	4,594			13	5,018			13	5,018
British West Africa			5	4,100			5	4,100	68	4,453	1	410			69	4,863
British South Africa	2	547	26	18,585	5	4,530	33	23,662	7	750	146	86,484	14	13,549	167	100,783
British East Africa					39	26,453	39	26,453	6	622	14	13,299	12	16,292	32	30,213
Egypt					2	13,929	2	13,929			82	34,075			82	34,075
Algeria and Tunis			65	32,129	53	46,497	118	78,626			262	209,486	104	86,784	366	296,270
Other French Africa			1	370			1	370	2	740	13	4,866			15	5,606
Liberia											2	792			2	792
Madagascar					3	3,035	3	3,035					1	1,107	1	1,107
Morocco			74	26,355			74	26,355			144	65,361			144	65,361
Portuguese East Africa			1	2,200			1	2,200			30	32,193			30	32,193
Other Portuguese Africa									1	129	4	1,900	2	750	7	2,779
Spanish Africa			10	3,700			10	3,700			10	3,778			10	3,778
Totals	384	$60,267	19,337	$11,213 333	849	1,488,988	20,570	$12,762,588	363	$64,342	24,048	$13,170,239	817	$1,491,639	25,228	$14,726,220

American Motorcycle Exports from 1920 to 1924

	1920	1921	1922	1923	1924
Europe:					
Austria (Prior 1920 A.-Hungary)	.....	*13*	*8*	*123*	*162*
	.....	$4,581	$2,050	$27,571	$35,969
Azores, and Madeira Islands	*21*	*8*	*4*	*5*	.....
	$6,797	$2,070	$1,188	$1,304	.....
Belgium	*1,033*	*532*	*1,027*	*591*	*347*
	$323,344	$175,212	$274,690	$133,949	$74,422
Bulgaria	*1*	*2*	.....	.....	.....
	$108	$453	.....	.....	.....
Czechoslovakia	.....	*33*	*87*	*364*	*387*
	.....	$10,704	$16,742	$91,025	$95,941
Denmark	*741*	*582*	*636*	*648*	*300*
	$208,406	$193,828	$165,327	$150,220	$68,440
Esthonia	.....	*13*	*22*	*96*	*7*
	.....	$3,992	$5,790	$25,329	$2,049
Finland	*259*	*111*	*74*	*221*	*281*
	$80,516	$41,860	$18,022	$51,302	$66,113
France	*672*	*292*	*296*	*451*	*193*
	$164,406	$79,278	$67,207	$86,287	$37,866
Germany	*5*	*7*	*135*	*142*	*476*
	$1,227	$2,350	$35,420	$31,361	$122,112
Gibraltar	.....	.....	*1*	*1*	.....
	.....	.....	$345	$275	.....
Greece	*18*	*23*	*3*	*1*	.....
	$5,447	$8,337	$483	$242	.....
Hungary	.....	.....	.....	.....	*6*
	.....	.....	.....	.....	$1,500
Iceland, and Faroe Islands	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....
Italy	*2,281*	*571*	*953*	*1,384*	*1,312*
	$652,450	$173,316	$236,509	$325,779	$302,713
Latvia	.....	*10*	.....	*13*	*116*
	.....	$3,667	.....	$3,942	$28,254
Lithuania	.....	.....	.....	.....	*6*
	.....	.....	.....	.....	$1,505
Malta, Gozo and Cyprus Isls	*24*	*1*	*12*	*1*	*9*
	$6,210	$225	$2,530	$191	$1,896
Netherlands	*5,181*	*1,938*	*2,251*	*2,063*	*1,613*
	$1,433,854	$614,580	$605,642	$503,731	$376,544
Norway	*1,788*	*385*	*456*	*535*	*131*
	$517,432	$133,309	$115,600	$128,503	$33,506
Poland and Danzig	*25*	*1*	.....	*66*	*276*
	$12,288	$271	.....	$17,084	$65,354
Portugal	*228*	*18*	*90*	*88*	*31*
	$74,350	$6,520	$25,856	$25,554	$8,220
Rumania	*4*	.....	*3*	*4*	*8*
	$1,644	.....	$1,083	$1,095	$2,249
Russia in Europe	.....	*7*	.....	*19*	*243*
	.....	$2,235	.....	$4,038	$52,419
Spain	*1,416*	*332*	*793*	*427*	*48*
	$457,841	$103,189	$211,269	$100,382	$11,604
Sweden	*5,888*	*1,328*	*427*	*1,099*	*607*
	$1,671,765	$421,888	$93,902	$261,941	$143,662
Switzerland	*591*	*84*	*176*	*321*	*205*
	$161,020	$32,960	$49,197	$72,516	$51,730
Turkey in Europe	*39*	.....	.....	.....	.....
	$12,036	.....	.....	.....	.....
England	*2,783*	*567*	*591*	*773*	*317*
	$786,419	$183,132	$147,801	$175,444	$78,924
Scotland	*117*	*5*	*5*	*1*	*2*
	$35,786	$1,543	$1,243	$300	$250
Ireland	*2*	*4*	*2*	*1*	*1*
	$624	$800	$225	$312	$130
Yugoslavia, Albania & Fiume	.....	.....	*3*	*18*	*29*
	.....	.....	$839	$4,588	$7,986
North and South America:					
British Honduras	*1*	.....	*1*	*1*	*1*
	$83	.....	$155	$135	$120
Canada	*1,313*	*506*	*711*	*729*	*762*
	$339,350	$157,401	$171,908	$160,448	$169,079
Costa Rica	*5*	*1*	*2*	*2*	*31*
	$1,542	$384	$295	$400	$3,096
Guatemala	*41*	*25*	*13*	*31*	*27*
	$13,085	$8,749	$3,669	$7,515	$6,886
Honduras	*5*	*4*	*4*	*17*	*5*
	$1,371	$1,224	$812	$3,216	$986
Nicaragua	*24*	*6*	*30*	*2*	*21*
	$7,748	$3,421	$4,464	$487	$4,503
Panama	*27*	*35*	*18*	*25*	*27*
	$8,264	$12,097	$4,659	$5,992	$6,729
Salvador	*18*	*11*	*1*	.....	*6*
	$5,815	$4,407	$315	.....	$1,535
Mexico	*61*	*99*	*149*	*67*	*103*
	$17,829	$32,442	$40,191	$14,284	$21,405
Newfoundland and Labrador	*1*	*1*	.....	*1*	*4*
	$470	$850	.....	$162	$357
Barbados	*8*	*5*	*5*	*1*	*2*
	$2,999	$1,703	$1,236	$100	$538
Jamaica	*58*	*23*	*9*	*15*	*9*
	$16,947	$5,502	$1,456	$2,789	$1,284
Trinidad and Tobago	*18*	*5*	*22*	*10*	*8*
	$6,043	$1,725	$6,559	$1,434	$1,559
Other British West Indies	*17*	*3*	*11*	*11*	*5*
	$4,863	$500	$1,931	$2,559	$645
Cuba	*221*	*60*	*22*	*54*	*52*
	$60,018	$19,157	$5,156	$11,932	$11,278
Dominican Republic	*29*	*8*	*2*	*19*	*3*
	$9,151	$3,179	$511	$2,993	$872
Dutch West Indies	*1*	*2*	*10*	*6*	*1*
	$387	$694	$2,338	$1,132	$150
French West Indies	*1*	.....	*2*	*1*	.....
	$250	.....	$489	$130	.....
Haiti	*9*	*1*	*2*	.....	*1*
	$2,089	$282	$633	.....	$90
Virgin Isls of United States	*2*	*3*	*1*	*1*	.....
	$966	$678	$100	$89	.....
Argentina	*597*	*125*	*215*	*295*	*159*
	$171,615	$41,440	$55,013	$70,314	$43,201
Bolivia	*6*	.....	*13*	*12*	*16*
	$1,694	.....	$3,420	$3,632	$4,010
Brazil	*268*	*1*	*33*	*60*	*43*
	$81,485	$488	$8,478	$12,931	$11,331
Chile	*130*	*1*	*6*	*14*	*5*
	$37,588	$400	$1,432	$3,301	$1,305
Colombia	*24*	*3*	*8*	*12*	*21*
	$8,082	$450	$1,399	$2,984	$4,906
Ecuador	*34*	.....	*1*	*4*	*1*
	$9,483	.....	$301	$646	$264
Guiana, British	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....
Dutch	*4*	*1*	.....	.....	.....
	$1,695	$480	.....	.....	.....
French	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....
Paraguay	*1*	.....	.....	.....	.....
	$312	.....	.....	.....	.....
Peru	*18*	*5*	*11*	*10*	*40*
	$4,918	$1,500	$2,612	$1,822	$8,448
Uruguay	*133*	*21*	*28*	*25*	*21*
	$40,767	$6,766	$7,145	$6,688	$5,523
Venezuela	*8*	*4*	*11*	*20*	*34*
	$2,384	$1,223	$2,193	$4,937	$7,995
Asia:					
Aden	.....	.....	*2*	*2*	.....
	.....	.....	$259	$520	.....
Ceylon	.....	.....	*49*	*35*	*28*
	.....	.....	12,632	$9,029	$6,834
China	*157*	*57*	*42*	*88*	*64*
	$49,874	$18,365	$12,690	$21,971	$12,912
Kwantung (leased territory)	*7*	*1*	.....	.....	.....
	$1,660	$300	.....	.....	.....
Chosen (Korea)	*19*	*12*	.....	.....	.....
	$5,283	$4,620	.....	.....	.....
British India	*1,331*	*213*	*245*	*264*	*154*
	$381,815	$73,901	$60,966	$64,353	$36,027
Straits Settlements	*344*	*18*	.....	*14*	*15*
	$87,415	$8,113	.....	$3,040	$3,717
Other British East Indies	*161*	*14*	*1*	*1*	.....
	$48,326	$4,336	$715	$124	.....
Java and Madeira	.....	.....	*239*	*151*	*146*
	.....	.....	$57,090	$31,588	$34,816
Other Dutch East Indies	*1,283*	*376*	*2*	*6*	*23*
	$371,762	$124,140	$400	$1,147	$5,212
Hejaz, Arabia and Iraq	.....	.....	.....	*1*	.....
	.....	.....	.....	$290	.....
Far Eastern Republic	.....	.....	*1*	.....	.....
	.....	.....	$184	.....	.....
French Indo China	*14*	.....	.....	*3*	.....
	$3,175	.....	.....	$600	.....
Greece in Asia	.....	.....	*2*	.....	.....
	.....	.....	$273	.....	.....
Hongkong	*167*	*36*	*34*	*56*	*79*
	$44,710	$14,832	$9,201	$11,293	$20,040
Japan	*751*	*555*	*735*	*1,234*	*1,474*
	$206,806	$181,367	$192,482	$295,555	$360,266
Palestine and Syria	.....	.....	*1*	*1*	*1*
	.....	.....	$370	291	$151
Persia	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....
Russia in Asia	*10*	.....	.....	.....	*2*
	$2,687	.....	.....	.....	$934
Siam	*19*	*7*	.....	*5*	*21*
	$4,864	$2,634	.....	$1,101	$4,305
Turkey in Asia	*5*	*5*	.....	.....	.....
	$1,235	$1,390	.....	.....	.....
Other Asia	.....	.....	.....	.....	*1*
	.....	.....	.....	.....	$102
Oceania:					
Australia	*2,910*	*803*	*3,706*	*6,605*	*4,161*
	$855,581	$229,245	$893,812	$1,625,565	$1,030,725
New Zealand	*2,007*	*440*	*806*	*1,667*	*1,039*
	$569,741	$149,815	$204,680	$426,409	$246,150
Other British Oceania	*7*	*1*	*1*	*13*	*6*
	$2,459	$431	$223	$2,506	$1,393
French Oceania	.....	.....	*2*	.....	.....
	.....	.....	$275	.....	.....
Other Oceania	*1*	*3*	*2*	*1*	.....
	$110	$759	$783	$290	.....
Philippine Islands	*200*	*50*	*35*	*52*	*46*
	$54,119	$15,044	$9,060	$10,915	$9,399
Africa:					
Algeria and Tunis	.....	.....	*1*	*3*	.....
	.....	.....	$390	$444	.....
Belgian Congo	*2*	*4*	*8*	.....	*2*
	$530	$845	$1,302	.....	$722
British Africa, West	*107*	*34*	.....	*11*	*9*
	$29,725	$8,745	.....	$2,493	$1,415
South	*1,536*	*455*	*547*	*839*	*978*
	$450,325	$144,089	$135,534	$203,172	$220,254
East	*27*	*39*	*13*	*44*	*22*
	$7,202	$14,253	$3,502	$10,862	$5,136
Canary Islands	*18*	*4*	*2*	*2*	*11*
	$5,835	$955	$725	$428	$2,682
Egypt	*284*	*12*	*21*	*69*	*20*
	$81,968	$2,828	$5,707	$17,921	$4,969
French Africa	*9*	*5*	*1*	*10*	*9*
	$2,091	$1,150	$184	$1,984	$1,745
Italian Africa	*1*	.....	.....	.....	.....
	$203	.....	.....	.....	.....
Kamerun	*4*	*5*	.....	.....	.....
	$968	$1,599	.....	.....	.....
Liberia	*1*	.....	.....	.....	.....
	$207	.....	.....	.....	.....
Madagascar	.....	.....	.....	.....	.....
	.....	.....	.....	.....	.....
Morocco	*3*	*11*	*42*	*36*	.....
	$1,050	$2,120	$6,928	$5,628	.....
Portuguese Africa	*37*	*12*	.....	*4*	.....
	$11,591	$4,352	.....	$905	.....
Portuguese East Africa	.....	.....	*40*	*4*	*26*
	.....	.....	$10,546	$856	$6,867
Spanish Africa	.....	*3*	.....	.....	*1*
	.....	$899	.....	.....	$182
Grand Total Number	*37,622*	*11,001*	*15,976*	*22,112*	*16,859*
Value	$10,756,580	$3,517,769	$4,028,742	$5,298,597	$4,006,408

Motor Transport Urged in Peru



Native Laborers in Peru Making a Deep Cut Through the Mountains for a New Road which, when Completed, will Further Stimulate Motor Traffic.

Below—A Typical Street Scene in Peru, Showing the Automobile as an Important Factor in the Transportation System of the Country.

One of the Improved Roads which have led to a Movement in Peru for a National Motor Transportation System.

By S. L. Leonard

SALES of automobiles and trucks in Peru during 1924 were large, approximating possibly 2000 vehicles, an increase of over 25 per cent in the number of cars in that country. The year 1925 gives every indication of being as good or better.

A principle reason for this is the continued prosperity of Peru. The prices of sugar, cotton, copper and wool and other products of the country have been good.

Exchange has ranged above $4 for the Peruvian pound, par being $4.84. Although this is at a considerable discount, still $4 is favorable compared with figures just after the past war crisis, and in addition, during the last year the rate has been relatively stable.

Another reason for the continued good business in motor cars is road construction. Not a little work is being done in this direction. It is beginning to be realized in the popular mind that Peru needs a transport system and that the most feasible way to secure it is by building roads and utilizing the motor truck, as roads for automobiles and trucks can be constructed and cars purchased for much less than it costs to build railroads.

Much time and not a little money has been lost in Peru by a futile attempt to cover the country with a network of railroads. Insufficient funds have existed for this purpose, and the territories through which the roads would pass are not sufficiently developed to pay the operating expense once built.

Public opinion in Peru now favors leaving great projects of rail connection behind for the time being, and beginning practically the creation of a modern Peruvian transportation system with the automobile. Later, when the country is developed to a degree where there is sufficient traffic to justify it, and where long distances make such lines of communication advantageous, railroads could be installed.

A practical lesson of what it is possible to do with motor vehicles has just been given in Peru, by two enterprising firms. First the Peruvian Autos, Ltd., sent a Graham Brothers 1½-ton truck south from Lima to Arequipa, a distance of more than 1100 kilometers. The trip occupied three months, on account of the difficult nature of the country, although the actual running time was only thirty-five days.

While this exploring expedition was still in progress, Graham Rowe & Co. started north a Hudson speedster, and made the run from Lima to Piura, another distance of a straight line of over 1000 kilometers.

Such extended continuous trips to the north and south of Peru had never before been made by a motor vehicle. They brought out many interesting facts, among others the adaptability of the balloon tires for running over sandy desert roads and the need of constructing bridges as well as highways. They also served to develop an enthusiasm among the inhabitants along the line in favor of greater activity in road and bridge building and motor transport.

These exploring expeditions will doubtless be followed by others, thus extending the knowledge of the possibilities of automotive traffic in Peru, and increasing the opportunities to make sales.

EDITORIAL

Service Show

DRAMATIZED service—that's a brief description of what the Second Annual Automotive Maintenance and Equipment Show is going to be, so far as we can see. It's going to be held at the General Motors Building in Detroit, May 20 to 23.

Last year a lot of people in the industry didn't fully appreciate how really important a show of this kind might be. Some manufacturers were even a bit dubious about its success.

But the results of the first service exhibit put to rout all pessimistic notions about its value. The presentation in one place of all the latest developments in service tools and equipment has an educational value that should not be underestimated. Car and truck builders who are spending annually thousands of dollars to help dealers improve their service methods and facilities can serve their ends with maximum economy by getting behind this year's exhibit with all the power of their direct contacts with retailers.

In reply to a questionnaire sent out by the N. A. C. C., 98 per cent of last year's exhibitors expressed a desire to have the show repeated. This year more space will be used to accommodate the show and the papers to be given at the convention accompanying the exhibits are going to be definitely applicable to practical service work.

The event was a success last year without major assistance from individual manufacturers. With such assistance this year it can be made a prominent milestone of the road to perfect service.

Engineers of Tomorrow

SUCCESSFUL engineers of 1925 need quite different qualifications than were required ten or twenty years ago. An automotive engineer today must be much more than a designer of cars or parts. He must have some general understanding of nearly every phase of the automotive business together with organization and executive ability. The modern car or truck designer who does not sense the sales angle of his work and who does not find it possible to coordinate his ideas with those of the production manager cannot be of maximum value to his organization.

The changing trend in general engineering requirements was noted by T. S. Baker, president, Carnegie Institute of Technology, recently, when he said that with larger plants and greater uniformity of products a premium will be placed on organization and administration. "The future industry," he said, "will require men of greater originality, initiative and professional skill. . . . This will be strictly engineering work, but the number of such men who will supply the technical direction of their concerns will not increase in proportion as business organizations grow in size and as they limit the variety of their output. On the other hand, the demand for organizers, administrators and executives of various grades will increase."

Open and Closed

OUT of forty-six passenger car companies replying to a query from AUTOMOTIVE INDUSTRIES, only six expect their closed car production to be less than 50 per cent of their total output in 1925.

Last year just a little less than 39 per cent of the cars built were closed. Despite the very considerable demand for models of this type recently two years were needed to record a 10 per cent gain in proportion of total output. Since the actual production is larger at present, percentage gains are harder to make.

In other words, manufacturers will have to build about 330,000 more closed cars this year than they did last if this type is to be 50 per cent of total car production.

Such an increase is perfectly possible and it may be made. Many makers, however, are estimating closed cars as 60 to 70 per cent of their 1925 schedule, so that there seems to be a little danger of underestimating open car demand at the present moment.

Expansion Dangers

IT is pretty generally agreed that motor vehicle output in 1925 won't be much greater than it was in 1924. A strong minority opinion exists that it won't be as great. Even the optimists don't see much chance of breaking the 1923 record.

The best estimates available at the beginning of this year indicated that production capacity was available to build in excess of 5,500,000 cars and trucks. The difference between production capacity and probable actual production was slightly greater at the beginning of this year than it was a year ago.

With these facts in mind it is difficult to see justification for major expansion of motor vehicle productive capacity. Individual companies may find need for increased facilities, it is true, but by and large little good will accrue to the industry from plant extensions at the present time. Even in the case of individual organizations it is well to bear in mind that very strenuous efforts will be necessary for any single company to increase materially its proportion of the total business this year.

Our Industry Today—

Production Increased, but Makers Advance Cautiously —Expect Larger Profits in 1925—Dealer Stock Satisfactory

NEW YORK, March 16—March production schedules are running ahead of February in most automobile plants, large increases in output appearing in several cases. By and large, however, makers are moving cautiously aand are taking care not to overload dealers. Dealers have been so loathe to stock cars in some places that temporary shortages may arise in certain areas when spring buying actually begins, but there is little danger of any permanent or widespread difficulties along this line.

Balance sheets of automotive concerns, some of which are appearing nearly every day, show that 1924 did not yield nearly as good profits as did 1923 in most instances, although a number of concerns made quite excellent showings considering the difficulties experienced in the early part of last year. Indications are that 1925 will see an increase in profits all along the line, although output is not expected to exceed that of 1924 by any great margin.

Despite important plant extensions by a few automobile companies, there is no general tendency to increase production capacity. A greater demand is expected in the next few weeks, but no great difficulty should be experienced in meeting it.

Price changes of importance are not to be expected in passenger cars at present. The Packard increase and the Peerless drop, which were announced a week ago, were based on individual considerations and cannot be considered a part of any general tendency to readjust prices again at this time.

Dealer stocks are in good shape throughout the country, and used cars are not any more troublesome than usual.

TO CONSIDER COOPERATIVE PLAN

NEW YORK, March 17—Consideration of a plan for a cooperative campaign of dealer education in merchandising methods will be given by committees of the National Automobile Chamber of Commerce and the National Automobile Dealers' Association, to be held in Detroit March 23, it is understood. F. J. Haynes, president of Dodge Brothers, is chairman of the manufacturers' committee.

AMERICAN RADIATOR EARNINGS

NEW YORK, March 17—The American Radiator Co. for 1924 reports net income of $11,153,728, against $13,928,636 in the previous year. The net for 1924, after allowance for preferred dividends, was equal to $8.58 a share on the $25 par common stock. The surplus after preferred and common dividends was $7,353,900.

Stocks at Low Point in Detroit Factories

Meeting Only Current Demand—Rapid Decline in High Priced and Open Bodies

DETROIT, March 16 — Continuing heavy buying of new cars at retail coupled with a maintenance of factory operations at approximately the retail rate of movement will bring the industry to the second quarter of the year with practically no stocks to meet the usual largely increased demand in this period. Not only are there few cars in dealers hands but there are no car stocks at the factories and inventories of material are lower than is usual at this time. In the face of this condition factory sales departments are looking for an almost certain shortage of new cars on May 1.

Banks of parts are being built up in some factories to prepare for estimated increased production requirements in April, but even this is being done conservatively as a measure of dealer protection. Should Spring buying develop in anything like the volume customary in this quarter it will be a physical impossibility for factories generally to get into maximum operation much before May 1, and even maximum operation is not equal to the concentrated buying of the Spring season.

If the ratio of favor which the low priced closed car has enjoyed in the early part of the year continues into the Spring the shortage will be more acute, as many factories are still organized on a basis of rather heavy open car production. Specifications for bodies include a considerable volume of higher priced body types in many if not most factories, and preparation by body companies to meet these specifications makes it practically impossible to turn to low priced body building to the extent that may be required. If buying is divided to a considerable extent as between open and closed body types the situation will be greatly modified.

Shipments from factories in the first quarter to date have been markedly in closed body types with the lower priced ones predominating. Statements at factories indicate that low priced closed body shipments would have been much higher had it been possible to get bodies in the quantities sought. In a number of lines it has been impossible to meet the closed body demand in the early months and many sales of open cars were made only on this account. In many other cases buyers desiring low priced closed body models have been induced to take the higher priced models rather than wait.

Developments of buying in the early months of the year are taken to indicate the practical certainty of a great shortening of the number of models offered by the average passenger car maker. The possibility of concentrating on only one or at most four or five models and being amazingly successful have been demonstrated conclusively. There is every indication that aside from the sport roadster there is little actual market for open cars. The touring car could be taken out of the automotive picture today and its passing would not create much of a disturbance. Retail experience is showing that the former

(*Continued on page* 560)

Coast Dealers Drop Freight Rate Case

NEW YORK, March 17—J. S. Marvin, manager of the traffic department of the National Automobile Chamber of Commerce, has sent word from Los Angeles that all the dealers who joined in the complaint against automobile freight rates have requested the Interstate Commerce Commission to dismiss the case without prejudice.

He reports that the hearings were officially closed and that the prior status of the industry with the railroads and the Commission is completely established. This broad cooperation on the part of the dealers with the manufacturers and the N. A. C. C. insures a continuance of the old basis by which automobiles shipped by railroad for export will have a lower rate than domestic shipments.

Dealer associations in San Francisco and Los Angeles have filed a complaint with the Interstate Commerce Commission requesting a reduction of present freight rates on automobiles and a refund of approximately $250,000 on shipments during the last two years.

A similar case is pending in Portland where Kenneth A. Moore, manager of the N. A. C. C. traffic office of Detroit, is in attendance, and where, it is hoped, a similar result will be obtained.

Argentine Congress Postponed to Fall

Pan-American Highways Meeting Delayed by Slowness of Delegates in Accepting

WASHINGTON, March 18—Notification of the postponement of the Pan-American Congress of Highways, scheduled to have met in Argentine in May was received this week by the Pan-American Union and by the United States Department of Commerce.

Cable advices, notifying this government of the delay, were meager but stated that the Congress would be held in October, the exact date of which would be announced later.

Two reasons are assigned, unofficially, for the postponement of the meeting, the first of these being the fear that the late Sixty-eighth Congress would not provide the necessary funds for the delegates of this country to attend and the other reason being that because of delay in acceptances from delegates from practically all of the countries that the time for preparation of an adequate entertainment and business program was too short to do justice to the event.

Officials of the Congress in Buenos Aires were notified by this Government that the postponement would occasion no inconvenience to this country.

Meanwhile Congress has appropriated $15,000 for the expenses of the Government delegates and their selection will be made by the President within the next month or six weeks it is expected. In addition to the Government delegates, nearly a score of delegates will go from the National Automobile Chamber of Commerce, the American Automobile Association and various allied organizations.

McCORD CHARGES DISMISSED

WASHINGTON, March 18—Charges of unfair trade practices filed against the McCord Manufacturing Company of Detroit, were dismissed this week by the Federal Trade Commission who dismissed the case exonerating the company, which is a manufacturer of automobile equipment and parts.

The complaint had to do with the resale price maintenance practices of the company which were subsequently found to be without foundation or justification.

OPEN FORD JACKSONVILLE PLANT

DETROIT, March 18—The new Ford assembly plant at Jacksonville, Fla., is now in operation. Approximately 600 men are employed on an eight-hour day, at which the plant has capacity for 150 cars daily. Separate display rooms for Ford cars, trucks and tractors and Lincoln cars are maintained. In addition to an improved body oven, the second of its kind in the United States, the plant contains a complete glass cutting and grinding department.

Business in Brief

Written exclusively for AUTOMOTIVE INDUSTRIES *by the Guaranty Trust Co., second largest bank in America.*

NEW YORK, March 18—Manufacture and trade continue on a moderately large scale, with no general trend apparent in current reports. A downward movement was recorded last week in security and commodity prices, wheat reaching the lowest point since the beginning of the year.

The gain in unfilled orders reported by the United States Steel Corporation was larger than was generally expected. Tonnage booked at the end of February amounted to 5,284,771 tons, comparing with 5,037,323 a month earlier and 4,912,901 at the close of February last year. The company's subsidiaries were reported to be operating at about 93 per cent. of capacity.

Building activity is approximately equal to that of a year ago. Contracts awarded last month in 36 States, according to the F. W. Dodge Corporation, represented a total value of $299,260,000, which is slightly larger than the January total and slightly smaller than that of February last year. Contracts in New York and northern New Jersey, however, were 43 per cent below the January figure and 41 per cent below that of a year ago.

Preliminary figures of foreign trade in February show exports of $373,000,000 and imports of $334,000,000, as against exports of $447,000,000 and imports of $346,000,000 in January and exports of $366,000,000 and imports of $334,000,000 in February last year. The export balance, amounting to $39,000,000, was the smallest since last July, but was larger than any other February balance since 1921.

The outflow of gold continued last month, net exports amounting to $47,000,000 as compared with $69,000,000 in January and $29,000,000 in December.

Fisher's index of wholesale commodity prices stood at 163.4 last week, comparing with 164.1 in the preceding week and 163.1 two weeks earlier.

Discounts by Federal Reserve banks increased $9,500,000 during the week ended March 11, nearly all the gain being in bills secured by Government obligations. Open market purchases declined $2,300,000, while holdings of Government securities increased $5,600,000. The circulation of Federal Reserve notes gained $3,300,000, total deposits $17,800,000 and total reserves $14,700,000. The reserve ratio declined from 75.6 to 75.5 per cent.

British Prices Cut by Car Producers

Durant and Delaunay-Belleville Among Companies Who Announce Reductions

LONDON, March 5 (*by mail*)—Durant Motors, Ltd., Delaunay-Belleville and other companies have made price reductions within the last few days. The 15.6 Rugby Saloon of the Durant line is now priced at £295, a reduction of £25. The Delaunay-Belleville reductions ranged from £35 on the 15.9 four-cylinder chassis, which is now priced at £415, to £65 on some of the more expensive models. The new price of the 22.6 seven seat touring car is £895, a cut of £65.

The 12-hp. two and four seater Bean models are now priced at £298. Previously the price of the two seater was £335 and the four seater £345. A. C.'s have slightly increased in price. The remarkable increase in the output of the Midland automobile and motorcycle factories has brought out the fact that there is a dearth of skilled workers. This handicap is being experienced not only in the assembling factories, but in plants where parts and machine tools are made.

THOMPSON GIVEN BANQUET

INDIANAPOLIS, March 19—Fred E. Moskovics, president of the Stutz Motor Car Co. of America, Inc., was toastmaster last night at a banquet given by the Stutz organization in honor of former president William M. Thompson who is leaving shortly for an extended European trip. Mr. Thompson is one of the veterans in the company, having started many years ago as treasurer and rising successively through the general managership to the presidency two years ago. He retired recently to give more time to extensive personal business interests.

R. A. Rawson, merchandising manager, has announced the addition of two new men to his department. Douglas Andrews, former assistant sales manager for Wills Sainte Claire is now assistant sales manager for Stutz, and Jay A. Ricker, formerly with the Cole sales department, has become associated with the Stutz in a similar capacity.

MOON REPORTS EARNINGS

NEW YORK, March 18—The Moon Motor Car Co. in its statement for 1924 reports net profits of $559,585 after all charges. Net sales were $9,287,670. Profits were $3.11 a share on the common stock as compared with $4.65 a share in 1923 when net profits totaled $842,008 with net sales $9,741,867. Net current assets at the end of the year were $1,864,522 with current liabilities $350,962.

New Transmissions Shown Indiana S. A. E.

Automatic Transmissions Featured at Technical Meeting—One Hydraulic Device Described

INDIANAPOLIS, March 16—The Indiana Section of the S. A. E. March 12 staged a transmission meeting that had all previous local section affairs beaten in the number and quality of papers presented. The general subject was "New Developments in Transmissions" and at least three new developments were described and shown, while several new developments of others were related. E. B. Sturgis of the Weiss Engineering Co. of Newark, N. J., presented descriptions, slides and models of several automatic transmissions which his company has developed. A spherical flywheel is used, inside of which there is an intricate mechanism which transmits the power, changing the ratio of transmission automatically in accordance with requirements between limits of 1:1 and 1:1 000. These are a development of a semi-automatic transmission which the Weiss Engineering Company had previously presented at S. A. E. meetings.

Hydraulic Operation Discussed

Another novelty was shown by S. O. White of the Warner Gear Co. in which the clutches of a special transmission are hydraulically operated. This new design is a development of a German production with hydraulically operated gears, and cut-a-way parts of the apparatus were shown, as well as slides. The Nichols mechanical gear shifting device was shown by A. C. Nichols, Jr. of Oshkosh; and J. L. Alspaugh of Columbus, Ohio, presented a description and working model of a semi-automatic development of the mechanical gear changer by which the operator can mechanically select the gear for changing or use the semi-automatic variation by which operation of the clutch alone will bring about a succession of gear changes.

B. C. Buxton, vice-president of the Apperson company, narrated the successful three-year experience of the Apperson company with the Cutler-Hammer gear shifter, which is standard on this car and has proved very satisfactory to several thousand owners. W. Campbell of the Campbell Transmission Company expressed the thought that pioneering for better transmissions and improved methods of gear shifting had at last begun to bear fruit, but that considerations of cost still confine practice generally to conventional channels. The last paper was that of Charles Trask, who presented the case of the friction transmission, which is still performing satisfactory service on various types of tractors and commercial jobs. He suggested that for light cars which approach cycle size the friction type might be found useful still, in spite of the fact that the type has now been abandoned for passenger cars.

Following the papers a lively discussion of all the types ensued. Section chairman F. F. Chandler appointed Fred E. Moskovics committee head to consider giving a dinner to visiting S. A. E. men the night before the 500 mile race. The demonstration of several cars with new gear shifting devices, which was held during the afternoon before the meeting, proved interesting to section members and simplified the presentation of some types at the meeting.

Test New Planes for Mail Service

NEW YORK, March 16—Equipped with a special landing brake, a "Mercury" bilplane built by the Aerial Service Corp., Hammondsport, N. Y., and designed for the night air mail service between New York and Chicago, has just been given its preliminary test at the Hazelhurst Field, Long Island.

Carrying a load of 1000 lb., 400 more than that transported by the regular air mail De Havilands, a speed of 105 m.p.h. was attained. The machine is credited with having a maximum speed of 120 m.p.h. and a landing speed of less than 55 m.p.h.

The emergency ground brake is incorporated in the tail skid and is provided to reduce the length of run after the machine has touched earth.

Sees Good Openings for Trucks Abroad

DETROIT, March 17—Improved opportunity for profitable truck business in most export markets is seen by Ward W. Mohun, export manager of Federal Motor Truck Co., who is back in Detroit after a globe encircling trip of one year, in which he visited dealers in practically all countries except those in Latin America.

Dealers abroad are turning to truck sales with a greater enthusiasm than they ever before have shown, Mr. Mohun said. Within the past three years there has been a marked change in sentiment on the part of the foreign dealer as to the money he can make by handling a line of trucks in conjunction with passenger car sales, and as a result many desirable connections are being made by American truck makers and entirely new markets opened up.

TO SELL WESTCOTT REAL ESTATE

SPRINGFIELD, OHIO, March 16—Judge Smith Hickenlooper of the United States District Court has issued an order that the real estate of the Westcott Motor Car Co. be sold at public auction Saturday, April 4, at 2 p. m. This decision was made as a result of the case brought by John R. Hurley against the Westcott Motor Car Co. B. J. Westcott, former mayor, is president of the company. Possession will not be given until Sept. 1, as the company has orders which will keep it busy until about that time.

G. M. Dealers' Sales 38,970 in February

Figure Compares with 25,593 in January and 50,007 Year Ago —Factory Sales Up

NEW YORK, March 18—Sales of General Motors cars by dealers rose from 25,593 in January, 1925, to 38,970 in February. These preliminary figures issued by the corporation include Chevrolet, Oldsmobile, Oakland, Buick, Cadillac passenger and commercial cars and GMC trucks sold in the United States, Canada and overseas. The record for February of this year is below that of the corresponding month of 1924, when 50,007 cars were sold by dealers.

Sales of cars and trucks to dealers by manufacturing divisions of General Motors in February showed the same general trend as the retail sales, reflecting the policy to produce only in accordance with current needs. The wholesale figures are 49,269 for February as against 78,668 in February, 1924, and further with 30,642 in January, 1925.

P. R. Moffett, Electric Battery Man, Dies

PHILADELPHIA, March 17—Capt. Paul R. Moffett, manager of automotive manufacturers sales of the Electric Storage Battery Co., died recently at the University Hospital. His death was caused by heart disease. He was 40 years old.

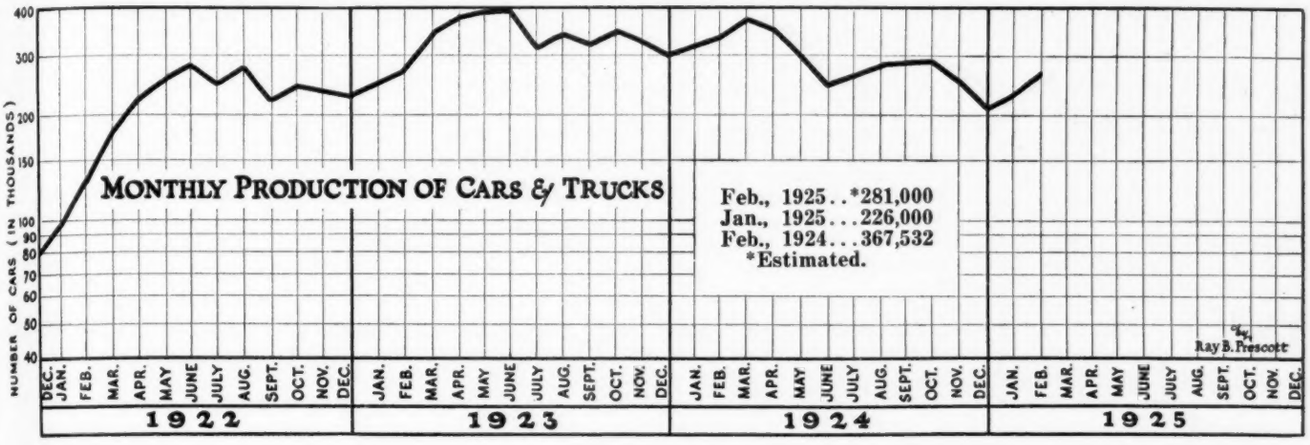
Captain Moffett was first employed as salesman in the Cleveland branch of the Electric Storage Battery Co. in 1911. His service was continuous, with the exception of about two years when he served in the Aviation Corps of the A. E. F. in France during the World War. He was honorably discharged with the rank of captain. Captain Moffett was a member of the Society of Automotive Engineers, Automotive Electric Association, Penn Athletic Club and was graduated from the University of Michigan, '09, with the degree of Bachelor of Science.

TOLEDO EMPLOYMENT GAINS

TOLEDO, March 16—Production at the Willys-Overland Co. plant here has now reached 1000 cars daily, and orders from the field indicate that this rate can be maintained or increased in the next few weeks with a big season's business ahead. Subsidiary automotive plants here have also been increasing their forces from week to week.

Last week the census of 51 plants here showed 24,695 at work, as compared with 27,603 the same week a year ago. There was a net gain of 472 last week and 466 the week before. The supply of labor is plentiful.

FEBRUARY PRODUCTION PLACED AT 281,000



New Mayfair at $485 Greatly Like Ford

BOSTON, March 16—A three-door five-passenger sedan model priced at $485 now is being produced by the Mayfair Manufacturing Co. of this city. The new car, which was exhibited at the automobile show held here last week, is from a mechanical standpoint, practically a replica of the Ford except that it has a disk clutch and a three-speed sliding gear transmission.

In the manufacture of the Mayfair extensive use is made of parts obtained from discarded Ford cars. Such parts are inspected and tested before being used and new parts used wherever necessary. The cylinder blocks are reground and fitted with oversize pistons. New bearings are used throughout the car.

An annual production of about 3000 cars is contemplated and the entire output will be sold in the Boston territory by the company's sales department. The car will be sold with a 90-day guarantee, but no service station will be established as it is stated that any garage can take care of this due to the use of standard parts.

American Bosch starting, lighting and ignition equipment is used in connection with a Westinghouse battery. Foot and hand brake both operate on drums on the rear wheels, the former being of the contracting type and the latter of the expanding design. Gasoline is carried in a tank at the rear and is fed to the carbureter by gravity. The removal of the gas tank from its conventional location has permitted reducing the height of the front seat so that the overall height of the body is 5½ in. less than the Ford, although the headroom is said to be the same. Sun visor, cowl ventilator, trunk and 30 x 3½ in clincher tires are regular equipment. The radiator is quite different in shape from the Ford design. The rear quarters of the body are covered with fabric and have ventilated oval windows in them.

The principals in the enterprise are Frank L. Hamilton, president and general manager; W. S. Carruthers and M. K. Coates, and it is understood that they have the backing of A. W. Lincoln & Co., Boston bankers.

Industry Favored by Indiana Laws

INDIANAPOLIS, March 16—Truck and bus interests of Indiana fared very well in the session of the legislature which recently closed. The conference report on the motor vehicle bill, which was adopted, raised the permissible truck weight to 28,000 lb., instead of the 20,000 lb. gross weight limit first proposed. Truck fees, though raised in some instances, are moderate in view of the attempts made to raise license fees on large sizes to exorbitant figures.

As was expected, the gasoline tax was raised from two to three cents a gallon, with two cents of the sums raised going to the State highway and one cent to counties for road work.

A last minute amendment to the motor vehicle bill imposes a license fee of $10 a seat for buses engaged in interstate commerce. This appears to violate a recent ruling of the United States Supreme Court that States have no right to interfere in interstate bus commerce, so automobile men are in hopes that it will be held invalid.

MICHELIN RAISES PRICES

NEW YORK, March 16—Effective today, prices on tubes are advanced 7 per cent by the Michelin Tire Company. Referring to the decline in tire prices to the lowest point in history, the company's announcement declares that recently there have been signs that "an upward turn is imminent." It points out that whereas smoked sheets of rubber sold at 19 cents in June, 1924, they are now around 39 cents.

SUCCEEDS MOLINE BODY

MOLINE, ILL., March 16—The E. H. Wilson Co., successor to the Moline Body Corp., Moline, Ill., was formally incorporated last week in Springfield with $975,000 capital.

Car Makers Placing Large Steel Orders

PITTSBURGH, March 17—Low prices on automobile sheets have caused the makers of cars and parts to enter the steel market with heavy orders during the past few days. The buying marked the abandonment of the automobile companies' policy of purchasing for only a month ahead. A number of the orders cover three months' requirements.

One of the largest companies in this district during the past few days sold more than 20,000 tons of automobile sheets. This is in contrast to sales that were almost negligible during the early part of March. Other makers of this grade of steel have experienced better business during the past week and one of these is reported to have received a contract from Ford for 5000 tons.

Prices at which these sheets were sold ranged from 4.40 cents to 4.60 cents a pound. The ruling figure was 4.50 cents. This compared with a price of 4.75 that obtained during the first quarter of the year and when compared with this time last year is $19 a ton lower. The market then was 5.35 cents.

START NEW WHITE BUILDING

SAN FRANCISCO, March 18—Work on the new million-dollar service building of the White Company was started here recently, when Miss Ruth Urquhart, daughter of G. A. Urquhart, vice-president of the company, lifted the first shovelful of earth from the site into a White truck. The building is to completed Oct. 1, 1925. The structure occupies 200 feet on Mission Street by 275 feet on Eleventh Street, and is claimed to be the finest truck-service plant west of Chicago. Particular attention has been paid in the plans to the "hooking-up" of the different departments, so as to handle the service at a minimum of cost and time. Of the 110,000 sq. ft. of floor space in the plant only 7000 is devoted to offices. The idea back of the building is that no White truck in central California ever need be more than 24 hours from skilled service.

Revolutionary Tire Process Described

Seiberling Announces Method of Vulcanizing Rubber Under Water—Laursen Inventor

AKRON, March 17—Perfection of an invention which may revolutionize the automobile tire manufacturing industry was announced here today by Frank A. Seiberling, president of the Seiberling Rubber Co. and former president of the Goodyear Tire & Rubber Co.

The invention is a method of vulcanizing rubber under water instead of in live steam, which has been used for curing since Charles Goodyear perfected his patent in 1839. The inventor is L. A. Laursen of Eau Claire, Wis., who has been working here for some time in the Seiberling laboratories.

Longer life is given the finished product by the Laursen method, it is explained, as the rubber, cured under water, retains its natural oils in almost perfect condition.

Tires and tubes already built by the Laursen method are said to give increased mileage. It is probable that the inner tube will be the first product built by the Laursen process to be placed on the market, and that a pneumatic tire, built by the same method, will appear commercially before the end of the year.

War Dept. Makes Awards for Plane Development

WASHINGTON, March 18—The War Department this week awarded $70,000 to the Curtiss Co. and $60,000 to the Douglas Co. for the experimental observation airplanes manfactured by each company and the development work involved in the production of these planes, which are considered safer and more maneuverable type for general observation use than the war-built Dh's now in use.

The awards were made as a result of tests conducted at McCook Field.

COPELAND ELECTS WILSON

DETROIT, March 18—William Robert Wilson, former president of the Maxwell Motor Corp., has been elected president of the Copeland Products, Inc., manufacturer of refrigerating equipment. Associated with Mr. Wilson as directors of the company are men well known in the automotive industry in Detroit.

FACTORY INVENTORIES LOW

(*Continued from page* 556)

touring car buyer is today to a large extent a low priced closed car buyer. Former coupe and sedan buyers are also turning to the lower priced body model though apparently there is enough demand for these two types to insure their continuance.

Willys Heads Confer on Speedy Service

TOLEDO, March 17—Methods and policies to assist in servicing Overland and Willys-Knight cars throughout the United States and Canada were discussed by Willys-Overland factory officials and a group of 65 parts sales managers from distributor and branch organizations throughout the United States and Canada at a three-day conference held at the Willys-Overland factory last week.

As a result of this meeting it is expected that parts stocks will be enlarged and service methods expedited throughout North America so that it will be possible for an Overland or Willys-Knight owner to obtain any active part for his car within twenty-four hours. Comprehensive stocks will be maintained in all cities possessing a population of 20,000 or more.

Title Responsibility Rests with Purchaser

WASHINGTON, March 16—Garagemen are left without protection in the purchase of automobiles through a decision rendered by the Supreme Court this week, which declared the National Motor Vehicle Theft Act valid and constitutional. The act puts the burden of proof on the purchaser.

The decision confirmed the conviction of Rae Brooks, who formerly operated a garage in Sioux Falls, S. D., and purchased in Sioux City, Iowa, two autos. Subsequently it was discovered that the cars had been stolen, and although Brooks aided in the investigation he was convicted of violating the Federal statute on two charges.

Sees Electric Truck Future Hazardous

NEW YORK, March 18 — Alfred Reeves, general manager of the National Automobile Chamber of Commerce, at the annual luncheon today of the transportation committee of the National Electric Light Association, said that the electric truck industry will soon find itself in a hazardous position if the producers do not take steps to broaden their sales field and cooperate in the promotion of their products.

START NEW PISTON PLANT

INDIANAPOLIS, March 17—A new automotive factory has been won by LaPorte, Ind., in the founding of the De Luxe Products Corp., which has become exclusive licensee of the well-known Clark-Turner De Luxe pistons which were formerly manufactured in Los Angeles by the Clark-Turner Co., whose plant burned down some time ago. Hobart M. Cable is president of the company and L. C. Bassford, chairman of the board of directors of the Aluminum Products Co. of Chicago, is vice-president. Landon B. Boyd is to be manager.

Lay Plans for 1925 Traffic Safety Drive

Herbert Hoover Chairman of Highway Conference, to Name New Committees

WASHINGTON, March 18—A 1925 traffic drive will emphasize the need for rigid enforcement of existing traffic laws as the principal means of reducing automobile accident rates, according to the Steering Committee of the National Conference on Street and Highway Safety which this week announced its program for the coming year.

New committees will be appointed by Secretary Hoover, Chairman of the Conference, to deal with (1) Uniformity of laws and regulations, (2) Enforcement, (3) Causes of accidents, and (4) Metropolitan traffic facilities. The standing Committees on Statistics and Public Relations will continue their work during the interval prior to the second National Conference to be held next fall.

The Steering Committee, which includes the Committee on Public Relations, has just concluded an important gathering here during which they considered progress made as well as plans for continuing the work of the Conference.

Secretary of Commerce Hoover stated that in his opinion two purposes of the 1924 Conference had been accomplished. These were, first, to focus public opinion on the appalling traffic accident and death rate each year, and, second, to prepare a comprehensive national program of accident prevention given in the report of the 1924 Conference. He recognized the contribution which is being made to accident prevention by the daily press, no national humanitarian movement having ever received finer cooperation from the newspapers.

TIMKEN ISSUES ANNUAL REPORT

DETROIT, March 18—Timken Detroit Axle Co. in its 1924 statement shows current assets of $7,069,442 of which $1,415,576 are in cash. Current liabilities are $1,606,570. Due to the company's decision to confine its operations to one manufacturing plant and to write off all machinery and equipment in its other plants, the year shows an operating loss of $203,319. Without the charging off of these items a profit for the year would have been shown, President Fred Glover declares in his statement to stockholders.

Although all of the Timken properties except for the main plant were closed last year in line with the restrictive policy, several departments of the Waterloo Ave. factory have been opened to take care of special work for the Hudson Motor Car Co. The property of this site has been placed on the market by the Timken real estate subsidiary at an approximate figure of $15,800.

Tire Sales Hearten Akron Producers

Dealers Stocks Said to Be Low—Output Speeded to Meet Demand

AKRON, March 17—Although retail dealers are usually well stocked at this time of the year, as a result of large shipments of spring dating orders, sales managers of several tire plants here report that many dealers have already sold practically their entire stocks of tires, purchased with a view of lasting at least two months longer.

This is regarded as one of the most encouraging signs in the tire industry, and indicates that there is no danger this spring of the manufacturers having overloaded the dealers.

There is considerable speculation as to the course of prices in the near future, but the general belief is that no immediate change will occur. A firmer tendency has been noted in tire prices, however, and if there is any change, the trend undoubtedly will be upward.

Production Reaches High Levels

New high levels in tire production were reached this week by manufacturers in the Akron district. Conservative estimates place the daily tire production between 115,000 and 120,000. Expansion of capacity now under way in several plants will boost the total production in a short time to more than 125,000 tires a day.

The Goodyear Tire & Rubber Co. has increased its tire production to 33,000 casings and 45,000 tubes a day, a gain of approximately 15 per cent over the production schedule in effect last month. More than 1000 men have been added to the factory payroll, in preparation for further production increases.

Goodyear's plant at Cuyahoga Falls, near here, formerly operated by the Marathon Tire & Rubber Co., is running close to capacity, with a production of 1000 tires a day. The Marathon plant was purchased from receivers about three months ago, and was placed in operation Feb. 15. Goodyear is now adding to its manufacturing facilities by completing an addition to its engineering building. This improvement was started several years ago, but was postponed on account of the slump.

Firestone Enlarging

New equipment is being installed by the Firestone Tire & Rubber Co. to provide for larger capacity. The company is now turning out approximately 32,000 casings and 40,000 tubes a day.

Production schedules at the B. F. Goodrich Co. call for a daily output of 25,000 casings and 33,000 tubes. While sales of tires have been satisfactory, especially the Silvertown cord, Goodrich has made its biggest gain recently in mechanical rubber goods, especially in the sale of rubber parts to automobile manufacturers. The Miller Rubber Co. is producing close to 10,000 tires a day, and General upwards of 4000.

Personnel Changes in Automotive Division

WASHINGTON, March 18—August Zimmerman, chief of the section of cars and trucks of the Automotive Division, United States Department of Commerce, has resigned that position to accept a position with the sales force of the Maxwell Chrysler agency in Baltimore, preparatory to entering the general sales department of the Maxwell Chrysler Company at Detroit. He has been section chief of the division since July of 1923. Among his previous business connections was that of Washington agent of the Harley Davidson Motorcycle Company.

As a token of their well-wishes Mr. Zimmerman was tendered a dinner by employees of the Division and given a leather brief case.

Percy Owen, Chief of the Division, also announces the resignation of W. H. Davidson, former Chief of the Section of Parts and Accessories, who has resigned to go into private enterprise. Mr. Davidson is succeeded by P. R. Mattix, formerly purchasing agent for the Steel Products Company at Detroit.

Improvement in 1925 Predicted by Reeves

PHILADELPHIA, March 18—The automobile industry this year will be better than last, it was predicted by Alfred Reeves, general manager of the National Automobile Chamber of Commerce, speaking at a dinner of the Philadelphia Association of Automotive Bankers.

"Conservative optimism characterizes the activities of the motor vehicle manufacturers," said Mr. Reeves. "Production totals each month this year have shown a steady improvement and this growth has been based on actual demands in the field rather than future hopes. There is every indication that the market in 1925 will be considerably above the demand in 1924, and the man who is contemplating purchasing a car would do well to do so this spring, if he wants to be sure of getting the particular make he may have set his heart on."

Mr. Reeves summarized his reasons for a favorable outlook as follows:

1. The excellent condition of the railroad business.
2. The conservative policy of manufacturing companies.
3. The sound and active Federal highway policy.
4. A broader understanding of the standards and needs of automobile financing.

ATWOOD MACHINE BUILDS

ROCKFORD, ILL., March 17—The Atwood Vacuum Machine Co. has let the contract for a new factory so that additional space will be available for expansion. The company manufactures door hinges and door bumpers.

Find Employment Conditions Good

Federal Survey Shows Normal Trend for Season in Automotive Districts

WASHINGTON, March 19—Reports contained in the February Industrial Employment Bulletin of the United States Employment Service, just made public here, indicate that the employment condition in the automotive industry of the United States for the most part is on a par with expectations.

Following is a detailed review of employment conditions at automobile centers:

Massachusetts, generally: Overtime prevails in certain departments of the automotive equipment plants.

New York, generally: The automobile industry as a whole is not operating at the rate expected for this month although a number of plants have increased their working forces, yet the volume of employment has not reached the level attained during the corresponding period of last year.

Jamestown industrial district, N. Y.: Auto-accessory plants are working overtime, with full forces.

Pennsylvania, generally: The automobile and accessory plants are becoming more active, employing additional workers.

Indiana, generally: Employment conditions in the automobile industry are steady, there being neither an increase nor a decrease in the number of workers employed.

Indianapolis, Ind.: A few automobile plants are entirely closed, which is creating a surplus of labor.

Kokomo, Ind.: All industries are operating on normal schedules with the exception of one automobile company, which expects to be in operation late in March.

Muncie, Ind.: Surplus of labor, particularly in automobile lines. One motor plant has closed down, affecting about 500 workers.

Detroit industrial district: A large surplus of automobile workers exists at Highland Park.

Flint, Mich.: Surplus of automobile factory workers and unskilled laborers. Automobile factories are running on fairly satisfactory schedules, owing to improved machinery and changes in methods, fewer men are needed.

Wisconsin, generally: Automobile factories are practically all operating full time.

Toledo, Ohio: A surplus of help is still apparent in the automobile industry.

H. A. VAN TINE DIES

NEW YORK, March 18—Harry Alfred Van Tine, who died here suddenly of heart disease, had been actively associated with various phases of the automotive industry for more than a quarter of a century.

His first position after leaving college was with the Singer Sewing Machine Co., going in 1902 to the John Wanamaker store to direct Ford car sales. Later he was affiliated with the Sidney B. Bowman organization.

He designed the S. G. V. automobile and many parts for the Hurlbut truck. In recent years he was engaged in perfecting a new type of Diesel engine.

Prepare Big Move for Foreign Trade

N. A. C. C. Representatives Organize Campaign to Remove Bars to Expansion Overseas

NEW YORK, March 17—Plans are in full swing for the series of meetings to be conducted in Europe next summer by representatives of the National Automobile Chamber of Commerce with the view to preparing the way for an expansion of American foreign trade in automobiles. Itineraries have been mapped out, dates are being arranged, and the material to be used by the speakers is being prepared.

Roy D. Chapin, chairman of the Highways Committee of the Chamber, is already in Europe making a survey of the situation and otherwise laying the groundwork. George F. Bauer, secretary of the Foreign Trade Committee, will follow late in April and conclude the physical arrangements for the meetings. John N. Willys, chairman of the Foreign Trade Committee, will leave in June to begin the meetings, which are to be conducted by dealer organizations and chambers of commerce.

Goal Is 25 Per Cent

The movement thus inaugurated will be the first concerted effort of American automobile manufacturers to consolidate the gains already made in foreign trade and to remove the long-recognized obstacles to further expansion in this direction. The ultimate goal is a total of foreign business at least 25 per cent of the total production of cars. The proportion is now about 12 per cent.

The automobile problems in foreign countries will be dealt with in a fundamental way by the American representatives. The point will be stressed that American manufacturers have no desire to monopolize the markets abroad, but rather to participate in a general expansion of the business, in which the domestic industries in the countries overseas would receive their proper share.

Drastic Laws Considered

Particular attention will be given to the legislative bars to the free use of automobiles. The viewpoint persists in many countries that the automobile is a luxury rather than a utility, and this is reflected in the taxes and other restrictions to which automobile owners are subject. In England, for instance, owners are taxed a pound a year a horsepower, which means approximately $110 a year for Ford owners. It is felt that a drastic change in the attitude of lawmakers toward the automobile must be brought about before automobile sales on a large scale are possible.

The effect of this situation on the domestic industries abroad is that large scale production is prevented. Consequently manufacturing costs are high and domestic interests find it difficult to compete on a price basis with American exporters. This is another of the points that will be stressed by the American automobile men.

SELDEN TRUCK PLANT SOLD AT $450,000

ROCHESTER, March 18—The sale of the plant and properties of the Selden Truck Corp. for $450,000 has been confirmed by Federal Judge Hazel of Buffalo. The buyer, Fabric Body Corp., Detroit, will act only as a holding company and the manufacture and sale of trucks and buses will be continued by a new Selden company now in process of organization.

The necessary transfers to the new corporation will be completed within the next ten days without interfering with present production procedure. Arthur S. More, president and receiver of the Selden Truck Corp., said today that the business of the company is now better than in any corresponding period since 1920.

Ford Adds 700 Daily to Time Purchasers

DETROIT, March 16—Records of the Ford Motor Co. show a daily enrollment of approximately 700 under the weekly payment purchase plan, this enrollment being spread throughout the country. There are at present more than 110,000 persons on the weekly purchase plan roll and more than 165,000 cars have been delivered in the twenty-three months that the plan has been in operation.

Comparison of these figures with the last official statement by the Ford Motor Co. on enrollments shows that the deliveries have increased by approximately 34,000 since Oct. 8, 1924, at which time they stood at 131,156.

ANNOUNCE BIG BODY ORDERS

KALAMAZOO, March 17—A body contract that will result in the operation of the South Pitcher Street plant of the Checker Cab Manufacturing Company for a period of several months is announced by B. D. DeWeese, general manager of the company. The contract is for the Hayes-Ionia Co., and to fill it the plant will be operated three days each week at nine hours a day and three days at 13 hours, thus insuring employees at least 12 hours of overtime every six days.

Mr. DeWeese further announces that the Checker Cab Company of Chicago has perfected financial arrangements whereby they have placed orders for 1000 checker cabs to be delivered over a period of two years. This is one of the most satisfactory orders as yet received by the local concern.

N. A. D. A. Starts Used Car Sales Campaign

First Advertising Copy Released for Publication April 1—Tryout Satisfactory

ST. LOUIS, March 17—A national used car advertising campaign under the auspices of the National Automobile Dealers Association which was decided upon at the Chicago convention is now ready for release and first publication will occur simultaneously all over the United States before April 1. There are now ten pieces of advertising ready for publication and it is planned to add more to the list.

A preliminary tryout was given the advertising by the N. A. D. A. in a comparatively obscure territory and the reaction, according to reports, was beyond fondest expectations. This is the first time that an effort will be made to unify the whole automobile dealer industry, not only members of the N. A. D. A., in an attempt to present the used car problem to the public in a way designed to increase sales and confidence of the buyers of used cars in reputable dealers.

All the expense of writing, preparing the matrices for publication, etc., is borne by the N. A. D. A. and the individual dealer will play only for the space he uses in his local newspaper or other advertising medium he uses. Dealer associations throughout the country will have an opportunity of making a co-operative advertising campaign out of it. Lord and Thomas Advertising Co. will have direct charge of putting over the proposition.

Report Record for Imports by Greece

WASHINGTON, March 16—The automotive Division of the Department of Commerce is advised in a cable dispatch from the Assistant Trade Commissioner at Athens that a record number of 1161 automobiles were imported by Greece during the first eleven months as compared with 428 cars, the figure for the entire year of 1923. It is of special interest to note, says the dispatch, that approximately 75 per cent of the imports were cars of American manufacture.

"It is estimated," continues the dispatch, "that there are today some 200 accessory shops, garages, etc., in Athens alone carrying spare parts and accessories. Although the French and Italian accessory manufacturers are making an earnest drive for business in this district and are quoting prices from 15 to 25 per cent lower than those of American accessories, the products from the United States remain very popular owing in part to the great preference in Greece for American cars. There is hardly any market for motorcycles."

Men of the Industry

Briggs Goes to London

S. D. Briggs has been made resident manager in Europe and the Near East for the Maxwell and Chrysler Motor Corps., with headquarters in London. Mr. Briggs has been serving with these companies as director of sales in charge of half of the United States territory. In his new capacity he will have charge of all sales development work in the British Isles, Europe, northern Africa and the Near East, working in conjunction with H. N. Salisbury, export manager.

Price Heads New Gear Company

E. C. Price is president of the Accurate Gear Co., recently incorporated in Springfield, Ohio, to manufacture flywheel starter gears and other gears for automobiles. Ray Kauffman is vice-president and sales manager, Stanley Kaufman is treasurer and general manager and H. E. Stummel is secretary.

Grove Moved to Butte

H. P. Grove has been promoted to district manager at Butte, Mont., for the Oakland Motor Car Co. He was connected for some time with the Cleveland branch of the company. The Butte district includes Montana, northern Wyoming, southern Idaho and the western sections of the Dakotas.

McMeans Appointed to Seattle

T. E. McMeans has been appointed manager of the Seattle district for the Oakland Motor Car Co., his territory including Washington, Oregon and the northern half of Idaho. He was formerly a branch manager for the Studebaker Corp., later becoming a dealer in Johnstown, Pa.

McKinley Goes With AC

C. W. McKinley has joined the sales department of the AC Spark Plug Co. He was formerly on the engineering staff at Cornell University, was chief engineer and production engineer for Willys-Overland and later was sales engineer for the Tillotson Carbureter Co.

Neumiller Succeeds Baxter

Charles F. Neumiller has succeeded to the presidency of the Holt Manufacturing Co., following the resignation of Thomas F. Baxter. Mr. Baxter's resignation came after the announcement that the control of the company had passed to the Pierce, Fair & Co. group.

Faulkner Opens Agency

Herbert A. Faulkner, former director of advertising and sales promotion for the Moreland Motor Truck Co., who has been ill for nearly a year, has recovered and is now opening an automotive advertising agency with branches in San Francisco and Los Angeles.

Barlow and Bidwell Take Branches

F. Briggs Barlow, formerly assistant sales manager of the Bethlehem Motors Corp., has been named manager of a new factory branch in New York. Harold F. Bidwell, for some time connected with the factory, has taken over the new Newark branch.

McNay Heads Bock Sales

M. S. McNay, for the past several years in the sales organization of the Bock Bearing Co., has been appointed sales manager. Previous to his connection with the Bock company he was sales engineer for the Hess-Bright Manufacturing Co.

Rohm Joins Detroit Force

H. V. Rohm, formerly Milwaukee sales manager for the Briggs & Stratton Corp., has been advanced to the Detroit office to be associated with F. W. Lawrence. The territory of the Detroit branch now includes Ohio and Indiana.

Ripley Made New York Manager

J. P. Ripley has been appointed manager of the New York district for the Fisk Tire Co., succeeding Ben Smith, who resigned. Until recently he was manager of the central district, with headquarters in Chicago.

Blackman Resigns from Northway

C. W. Blackman has resigned as vice-president, director and general manager of the Northway Motors Corp. and also of the Amalgamated Motors Corp. Mr. Blackman before becoming associated with these companies, was for several years business manager of *Motor Transport*.

Yocom Joins Multibestos

Alvin M, Yocom was recently named chief engineer of the Multibestos Co. He has for years been a specialist on brakes and brake design.

CALIFORNIA REPORTS INCREASE

SAN FRANCISCO, March 17—Figures just released by the State Motor Vehicle Department show an increase of 11,855 automotive vehicles sold in this district, central California, for the year from Feb. 1, 1924, to Feb. 1, 1925, over those of the same twelve months of 1923-1924. The total for 1924-1925 was 247,057, as against 235,202 a year ago.

The dealers consider the fact that only two counties, and those in the heart of the mountainous section, where paved highways are not plentiful, and population rather sparse, showed a decrease in sales, as a better condition than was expected in the fall of last year.

Murray Co. Stock Holdings Exchanged

Murray Body Corporation Takes Shares of Older Manufacturing Organization

DETROIT, March 17—By action of the stockholders of the J. W. Murray Manufacturing Co. at a meeting this week control of the company passes to the recently formed Murray Body Corporation, the basis of the stock exchange being two and one-half shares of the common stock of the Murray Manufacturing Co. of $10 par value for one share of Murray Body common of no par value.

The Murray Manufacturing Company will remain a separate entity under the plan, the control, however, being vested in the body company. There is no change in officers of the companies as a result of the change in control, which to a large extent was a technical procedure, as the Murray Body organization is an outgrowth of the manufacturing plans of the Murray Manufacturing concern. J. W. Murray, chairman of the board, and J. R. Murray, vice-president, were the guiding forces of the Murray Manufacturing Co.

A large part of the output of the manufacturing concern is taken by the body corporation, the uniting of the two companies placing the body building operation almost entirely on a self-sustained basis and setting up important economies. The properties of the Murray Body Co. now include the Murray plants and the former Wilson, Towson and Widman body plants. The factories are adjacent, making possible practically continuous process between the metal stamping and wood-working units. A new Murray manufacturing plant in the Down River Section in which heavy stampings and frames will be made are practically ready for operation.

McCarthy New Pierce Assistant Sales Head

DETROIT, March 17—The recent appointment of O. E. McCarthy as assistant general sales manager of the Pierce-Arrow Motor Car Company and A. A. Crumley, George E. Smith and Fred D. Markee as territorial managers has just been announced by L. E. Corcoran, general sales manager of Pierce-Arrow. This addition of four new executives to the sales staff of the Pierce-Arrow Motor Car Co. is in accordance with the policy of expansion now being carried out by the company, says Mr. Corcoran.

All of the new men are veterans of the industry. Mr. McCarthy began in 1900, when he joined the Locomobile company. Later he was with the Packard distributing organization in California. He comes to his new post from the Pierce-Arrow Truck Sales Corp. of Boston, of which he was manager.

General Motors Show Trend in Car Sales

Progressive Gain in Closed Cars Over Long Period—Move Quickened Recently

NEW YORK, March 16—The trend in car sales is shown in figures just given out by the General Motors Corp. In 1924, the figures reveal, General Motors closed car sales were 43 per cent of the total sales of the company. This compares with 37 per cent in 1923 and 28 per cent in 1922. For the first three months of 1925 closed car sales are estimated at approximately 53 per cent, compared with 39 per cent a year ago.

While the recent marked demand for popular priced coaches has emphasized the trend of public taste toward closed cars, an analysis of General Motors sales shows that open models have been losing their dominating place gradually over an extended period, and all closed car models have shared the business thus diverted.

The percentage of closed cars to total cars sold by General Motors by months, over a period of three years, follows:

	1924	1923	1922
January	42%	34%	29%
February	38%	35%	29%
March	38%	36%	25%
April	42%	40%	22%
May	41%	38%	19%
June	37%	35%	26%
July	37%	31%	26%
August	40%	30%	31%
September	42%	35%	37%
October	52%	38%	24%
November	71%	42%	30%
December	68%	44%	39%
For the year	43%	37%	28%

This comparison includes Chevrolet, Oldsmobile, Oakland, Buick and Cadillac, so the figures are representative of practically all price classes.

DURKEE-ATWOOD EXPANDS

MINNEAPOLIS, March 17—The Durkee-Atwood Co., manufacturers of Rie Nie fan belts, radiator hose and other automotive products, announces the purchase of the property of the Archer Tire Co., also of Minneapolis. The new acquisition is a three-story brick building and will be known as Plant No. 3. It is 80 ft. wide by 168 ft. long and has approximately 40,000 sq. ft. of floor space.

JEWETT ROADSTER ANNOUNCED

DETROIT, March 19—Paige-Detroit Motor Car Co. announces that its line of Jewett sixes will be supplemented April 1 with a new model roadster. The price of $1,630 f.o.b. Detroit will include five balloon tires, bumpers front and rear, sidelights on cowl, automatic windshield wiper, rearview mirror, sun visor, one piece windshield, and finish in two-tone gray. A full-width folding seat is provided under the rear deck. Four wheel brakes or steel wheels are optional. The motor is the standard Jewett six which was described in AUTOMOTIVE INDUSTRIES Jan. 1, 1925.

Ford Sold 125,000 Cars in February

DETROIT, March 17—Retail sales of the Ford Motor Co. for the month of February totaled 125,421 cars and trucks and 7211 Fordson tractors. These figures do not include sales in Canada and British possessions which are served by Ford Motor Co. of Canada, Ltd. Retail deliveries in the United States reached 112,526 cars and trucks and 5914 Fordsons.

Late sales reports of the company indicate that spring business is opening up promisingly and the outlook is for rapidly increasing activity. Daily domestic deliveries of cars and trucks have more than doubled since early in January. The largest increase came in the latter part of February, reflecting the upward trend of business which is now under way and the optimistic outlook for March.

Reports also indicate improving conditions in the high priced car field. Lincoln cars set a new February record with 508 domestic retail deliveries, as compared with 426 for the same month a year ago.

An interesting feature is shown in the sales of Fordson tractors, which have made a rapid gain, particularly through the agricultural sections, indicating that the farmer is coming in stronger as a buying factor. Daily sales of Fordsons are now four times as great as they were early in the year.

Continue Electric Sales Campaign

NEW YORK, March 17—Indorsing the sales promotion campaign conducted last year by the Society for Electrical Development, representatives of all prominent electric truck and battery manufacturers met here recently and subscribed a tentative budget of $25,000 for a similar campaign for 1925.

In accordance with the budget approved by the participating companies, a well defined program of sales promotion, dealing with the preparation and distribution of special articles for trade journals and newspapers, will be put into effect. There will also be special studies dealing with the logical relation of central station to the electric truck industry.

During the past four years the number of electric trucks in use has shown an increase of 64 per cent.

AMERICAN FIRMS IN MILAN

PARIS, March 7 (*by mail*)—Milan will hold an automobile show in a specially constructed hall in the center of the city from April 11 to 27. American firms taking part are Ford, Lincoln and Chrysler. The entire Italian industry will be represented; the leading French firms have secured stands, and other foreign firms are Rolls-Royce for England, Steyr representing Austria, and Benz, Mercedes and Wanderer from Germany.

FINANCIAL NOTES

Spartan Rubber Company's plant, Yardville, N. J., near here, has been sold to a Trenton syndicate headed by Michael Cilinsky, a scrap rubber dealer. The consideration was $40,250. The property was appraised at $77,000. The sale was made by Ernest Stahl, receiver in bankruptcy, and was confirmed by the United States District Court. The Spartan plant, which made automobile tires and tubes exclusively, was controlled by Newman Brothers, of New York, who took over the factory upon the failure of the Zee Zee Rubber Company a few years ago.

E. I. du Pont de Nemours & Co., reports that at a meeting of stockholders the quarterly dividend on common stock, payable March 16, was increased from 2 to 2½ per cent, equal to an annual rate of 10 per cent, and points out that the recent increase by the General Motors Corporation of the dividend on its common stock from $5 to $6 a year, resulted in increasing the company's income from this source from $6,423,600 received in 1924 to approximately $7,900,000 per annum.

Motor Products Corporation net earnings for the year ended Dec. 31 were $1,024,234, against $2,038,412 in 1923 and $1,400,618 in 1922. These are equal to $12.56 a share on the 62,500 shares of common stock after providing for dividends amounting to $250,000 on the 62,510 shares of $4 cumulative preferred. This compares with $31.66 earned for the common stock in 1923 and $10.17 a share in 1922.

Motor Wheel Corporation reports increased orders from car maker in the past four weeks making it necessary for the company to place practically all departments on a full six day schedule, the half day Saturday being eliminated for the present. There are now 2000 employees on the pay rolls, the number in some departments having been doubled during the past month.

Electric Storage Battery Co. reports gross sales of $12,122,460 for 1924, against $11,836,030 for 1923, and operating profit of $6,606,861 in the previous year. The net income for 1924, after deductions, left a balance equal to $7.96 a share on the outstanding common and preferred stocks, which share equally. In 1923 the balance was equal to $7.96 a share.

Hertz Drivurself System, Inc., has been organized under the Delaware statutes with a fully paid capitalization of $1,000,000 by John Hertz and others of the Yellow Cab interests to carry out a plan of motor car rental service under a system of locally-owned and managed branches.

Wills Sainte Claire, Inc., as of Dec. 31, 1924, shows total assets of $9,604,464, comparing with $9,554,485 at the end of 1923. Current assets totaled $3,456,631 and current liabilities $262,669, as against $3,290,879 and $420,109 respectively in the previous year.

Mason Tire & Rubber Co., for the year ended Dec. 31 reports net sales of $9,122,961, against $7,006,916 in 1923. After deducting expenses, depreciation, interest and other charges, net loss was $48,561, against net loss of $535,774 the previous year.

Miller Rubber Co., has resumed dividends on the common stock at the rate of $1.50 a share quarterly. Net profit for the calendar year 1924 was $2,216,878, after depreciation, taxes and interest.

NEW PLANT FOR TURNER

KOKOMO, March 17—Work is to be started soon on the construction of a large new plant for the Turner Manufacturing Co. of this city, it is announced by E. W. Turner, president and general manager of the concern, which manufactures automobile accessories. A transaction has been completed by which the firm purchased a tract of ground on West Superior Street, near the downtown district, where the factory will be erected.

Says Couzens Owes on Ford Stock Sale

Senator Told He Should Have Paid $10,000,000 More Taxes on Transaction

WASHINGTON, March 19—The feud between Senator Couzens of Michigan and the Treasury Department was intensified this week when the Senator revealed that the department had suddenly served notice upon him that he owes an additional tax of between $10,000,000 and $11,000,000 on a transaction six years old, involving the sale of his interest in the Ford Motor Company.

After reading a letter which Mr. Couzens said he had been called out of the Senate chamber on March 7 to receive from David H. Blair, Commissioner of Internal Revenue, and his assistant, the Senator said that when the minority stockholders sold their stock to Henry Ford in 1919 at $12,500 a share the Internal Revenue Bureau had fixed the profit for taxation purposes at the difference between this figure and $9,400 a share, which the stock was assumed to be worth as of March 1, 1913, the date fixed by the tax law as the basis for the computation of taxes on profits from the sale of capital assets in existence before that time.

In the memorandum handed with the letter to him, he said, it was sought through the use of "ridiculous computations and ridiculous figures," to arrive at the conclusion that the value of the stock as of March 1, 1913, was $2,500 a share, and that the minority stockholders owed a tax on the difference per share between that figure and $9,400.

The letter from Mr. Blair says in part:

> An examination of your return for that year shows that the figures mentioned in the memorandum as of March 1, 1913, market value of the stock for taxation purposes, approximate the value upon which the tax was originally assessed, but there appears nothing in the files of the bureau to sustain the correctness of this value. The memorandum, on the other hand, makes out a prima facie case of too low a March 1, 1913, value.

Senator Couzens obtained unanimous consent to have printed in The Congressional Record a memorandum supporting the original valuation.

H. P. FEDERSPIEL DIES

DETROIT, March 17—H. P. Federspiel, assistant sales manager, Hudson Motor Car Co., died this week in Los Angeles, where he had gone in search of health following an attack of ill health several months ago. Mr. Federspiel, a native of St. Louis, had been a member of the Hudson factory organization for several years past, making his home in Detroit. The funeral was held in St. Louis and was attended by Harry G. Moock, sales manager, and W. A. James, assistant sales manager.

Show Farm Savings by Use of Tractors

WASHINGTON, March 16—Savings of farmers throughout the United States in both money and time through the employment of tractors instead of horses is accentuated in a statistical bulletin just made public here by the Bureau of Agricultural Economics of the Department of Agriculture. The bulletin covers the year ended March 31, 1924. Credit is given the National Automobile Chamber of Commerce for some of the data it contains on tractors, trucks and automobiles.

It is shown that only 4 farms out of 267 selected for statistical purposes in Ohio, Indiana and Illinois are plowed by horses alone. On 53 per cent of these farms the farmers use tractors only, while on 45 per cent of them they use both tractors and horses.

The fact is also brought out that the cost of keeping horses on 286 selected farms averaged $1,076 per farm, while the cost of tractors for drawbar work averaged only $341. Thus it is shown the cost of the tractor was only 24.1 per cent of the total cost.

Federal Trade Body Cites Frame Makers

WASHINGTON, March 18—In a complaint just issued here by the Federal Trade Commission, the Midland Steel Products Co. of Cleveland, Ohio, is alleged through its business activities to have restrained in interstate commerce the sale and distribution of automotive frames and frame parts in certain sections of the United States.

According to the citation, the Midland Steel Products Co. was organized for the purpose of acquiring the capital stock, properties, assets and business of the Parish & Bingham Corp. of New York City and the Detroit Pressed Steel Co., of Detroit, Mich., both of which companies were engaged in the manufacture of frames for automotive vehicles.

The complaint further recites that since the respondent acquired the two companies it has sold about one-half of the total number of frames and frame parts for automotive vehicles which are sold annually in the United States, the remaining half being sold by about six frame manufacturers, who have been and now are competing among themselves and with the respondent in the sale of such frames.

ADD TO LACQUER WORKS

TOLEDO, March 16—The Mountain Varnish & Color Works, Inc., has started work on an addition to the plant for the storage of cellulose used in the manufacture of the new lacquer enamel automobile finish which has recently gained popularity.

President W. W. Mountain announced that the company will have a capacity for 1500 gallons a day of the lacquer enamel finish.

METAL MARKETS

In the absence of worth while developments, the steel market continues to indulge in post-mortem discussions of the boom that died before there was a chance to put over the higher prices which were planned. Solace is found in the thought that if these advances had really been insisted upon orders would have shriveled up whereas present commitments, disappointing as they are in some descriptions of finished steel, still suffice for orderly operating schedules.

Passenger motor car builders and parts manufacturers continue to figure as regular buyers even though the tonnages involved in individual orders are modest. Some of the Pittsburgh district mills are reported to be slashing prices on full-finished automobile sheets, sales at $2 to $3 below the nominal 4.60c. base price being rumored. Several of the Mahoning Valley sheet-rollers assert that they are still resisting the advances of buyers who claim that they can buy at these prices, and that they are adhering to the 4.60c. base.

Certain it is that the sheet bar market has come down to $37, Pittsburgh. Here, too, Youngstown shows its imperturbable optimism, claiming that leading producers there are holding out for $39. Obviously, there can be no $39 sales when the material is freely obtainable at $37. Sheet bar producers who work up part of their output in their own sheet mills are merely striving to put some backbone into non-integrated rollers by supporting a relatively high sheet bar market. Black sheets come in for equally sharp competition. In fact, the whole sheet market is ragged, with mills that see their backlog of orders dwindling to a point that threatens sharp curtailment of operations, not letting any business that is half-way acceptable, slip through their fingers.

No change is noted in the strip steel situation, and makers of cold-finished steel bars are still trying unsuccessfully to bring selling prices into greater harmony with the cost of their hot-rolled raw material. All along the line, consumers resist every upward revision of prices, no matter how modest, and, for the present at least, they are in full control of the situation.

Pig Iron.—The old, old story of buyers turning their back on a declining market is again true of the iron market. Large automotive foundries do not seem to consider the $21 base price the last word in the decline, although the bottom of the market appears to be almost in sight.

Aluminum.—Arrivals of foreign aluminum are light, although shipments from Norway and England are beginning to be more regular. This metal has all been sold before arrival. Automotive consumers are specifying against second-quarter contracts or scouring the market for what little in the way of resale metal may be lying around loose. It is learned that the German prohibition of imports of unwrought aluminum continues in full force, and that this measure is aimed at protecting the German aluminum industry against the possibility of dumping by American interests. Acquisition of a bauxite property in West Germany by American interests and the control of the Norwegian industry by the latter has made the Germans nervous. The domestic producer is very active in the export market. Prices are unaltered.

Copper.—While the market is lower, its tone is more cheerful.

Calendar

SHOWS

April 1-17—Sydney, Australia, Royal Agricultural Show. Embraces automobile exhibits.

April 8-14—Bandoeng, Batavia, automobile show under auspices of Netherlands Indies Jaebeurs Fair Association.

April 22-May 7 — Melbourne, Australia, International Automobile Show, under the auspices of the Chamber of Automotive Industries, in conjunction with the Royal Automobile Club of Victoria.

May 20-23—Detroit, Second Annual Automotive Maintenance Equipment Show, General Motors Building, conducted by the National Automoblie Chamber of Commerce, with cooperation of the Motor and Accessory Manufacturers Association, National Automobile Dealers Association. Society of Automotive Engineers, Automotive Equipment Association, Automotive Electric Association and the Automotive Manufacturers Association, Sam Miles, manager.

Sept. 21-26—London, England, Annual Cycle and Motorcycle. Show under auspices of the British Cycle and Motorcycle Manufacturers and Traders Union, Ltd.

Oct. 8-17 — London, Olympia passenger car show.

Oct. 29-Nov. 7—London, annual truck show.

RACES

April 30—Fresno, Cal.

May 11—Charlotte, N. C.

May 30—Indianapolis.

June 13—Altoona, Pa.

June 20—Baltimore, Washington Speedway, Laurel, Md.

July 26—Paris, Montlhery Track, French Grand Prix.

Sept. 7—Altoona, Pa.

Sept. 30—Fresno, Cal.

Oct. 10—Baltimore-Washington Speedway, Laurel, Md.

Oct. 24—Charlotte, N. C.

Nov. 26—Los Angeles.

CONVENTIONS

May 6-9—Ninth annual meeting of the American Gear Manufacturers Association at William Penn Hotel, Pittsburgh.

May 20-23—Detroit, General Motors Building, National Automotive Service Convention conducted by the National Automobile Chamber of Commerce with the cooperation of Motor and Accessory Manufacturers Association, National Automobile Dealers Association, Society of Automotive Engineers, Automotive Equipment Association, Automotive Electric Association and Automotive Manufacturers Association.

June 22-27—Summer convention of the Automotive Equipment Association at the Broadmoor Hotel, Colorado Springs, Colo.

S. A. E. MEETINGS

National

April 29-30—Tractor meeting in Chicago.

June 15-19 — Summer meeting of the Society of Automotive Engineers at White Sulphur Springs, W. Va.

Sept. 15-16—Production meeting and exhibition.

Sept.—Automotive Transportation meeting.

Nov. — Service Engineering meeting.

Sectional

March 20—Chicago Section, Recent Progress in Various Fields of Automotive Engineering, H. L. Horning, John S. Erskine, and M. E. Chandler.

March 26—Minneapolis Section, Automotive Rail Car Engineering, S. E. Brennan and various railroad men of the twin cities.

March 26—San Francisco Group, Effects of Engine Operation in Lubricating Oils, L. Wagner.

March 27—Los Angeles Group, Air Cleaners, Prof. A. H. Hoffman.

April 7—Buffalo Section, Transportation meeting.

April 9—Indiana Section, J. H. Hunt, Electrical Instruments for Automotive Research.

June 15-19—Summer meeting of the Society of Automotive Engineers at White Sulphur Springs, W. Va.

Less Demand Noted for Car Body Woods

ATLANTA, March 17—Contrary to the expectations of the lumber industries in the Southeast, hardwood sales to the automobile body manufacturers have failed to maintain the gains noted three or four weeks ago, and though buying is still on a fairly respectable basis, orders are considerably less than manufacturers had counted upon as a result of the heavy inquiries received from the automotive manufacturers during January and the early part of February.

Also there has been an appreciable falling off in inquiries the past three weeks, with both inquiries and orders running at present somewhat below the volume of business being placed by the body makers at this time last year. There is every indication, however, that the present lull is only temporary and that spring will witness a considerable revival in the hardwood demand from this source. Present demand is primarily for thicker dimensions of ash, though maple and elm also is reported fair. Prices are being well maintained throughout the list.

FORD STEAMER DUE

SAN FRANCISCO, March 17—The steamer "Onondaga" of the Henry Ford fleet will arrive in San Francisco on or about March 18, according to announcement by the Ford Motor Company offices here. The ship is bringing about 1500 tons of auto parts for the Ford branch in San Francisco, and will carry general cargo on its return to the East coast. Cargo is stowed in the holds in practically the same manner as the loading of box cars, a departure in the shipment of automobile parts.

SEDAN BODIES FOR AUBURN

KALAMAZOO, March 17—The Limousine Body Company of this city is building sedan bodies for the Auburn Motor Car Company, Auburn, Ind., having a contract that operates the plant at about 60 per cent of its normal capacity. According to J. D. Bobb, president, eight jobs daily are being handled now, but this scale of production will be increased to 15 daily, which is about the capacity of the local factory.

"Auburn, like a majority of the makers of better grades of medium priced cars, is specializing on closed cars," said Mr. Bobb. "The production is today about 70 per cent closed models and 30 per cent open models. That concern makes fours, sixes and eights, and I understand has a production campaign of 10,000 cars outlined for the present year."

ATTACK TRUCK LEGISLATION

SPRINGFIELD, ILL., March 16—Bus and truck owners of the State are preparing to launch an attack upon the Phillips-Kessinger bills in the lower house of the State legislature and the senate, to regulate the weight of trucks on paved highways, the suggested legislation being based on the charge that heavy machines are pounding the life of the State highways away.

LOCOMOBILE BODIES ORDERED

LANSING, March 16—Auto Body Co. reports the signing of a contract with the Locomobile company under which it will build all touring car bodies for the Bridgeport company. Contracts for other Locomobile bodies may also be awarded under plans which are now under consideration.

Auto Body reports heavier orders for bodies from passenger car companies during the last month.

Business Is Good at Boston Motor Show

BOSTON, March 16—Boston's twenty-third annual motor show was concluded Saturday evening with expressions of satisfaction from both dealers and visitors. The display was noteworthy for a consistently good attendance that resulted in more actual sales than a year ago and provided dealers with exceptionally good lists of prospects.

It was the consensus of opinion of those concerned with the management of the show that the elimination of trade tickets was a considerable help in preventing unwieldy crowds, and salesmen were able to establish a better contact with prospects than in former exhibitions. The claim was made by some of the retailers that the average tone of prospects was so healthy that there would probably be a shortage of cars in this territory in the next few months.

As was expected, there were hundreds of local prospects that are holding off until warmer weather. Especially since most of these people are interested in closed cars, many retailers construed this as another indication of the prevailing tendency for increased closed car demand. On the other hand, there was distinctly evident an element that looked only at the roadster models.

CHARGES PATENT VIOLATION

DAVENPORT, IOWA, March 16—The Bassick Manufacturing Co., Chicago, has filed suit in the Federal Court here against Horst & Wilkinson Co., local accessory dealers charging violation of patent rights on the "Alemite" lubricating system and threatens injunction proceedings to halt sales of devices which it is said are infringements.